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REINFORCED CONCRETE STANDPIPES

Descriptions of Those Built at Fort Revere, Mass., Milford, O., and Attleboro, Mass.—Cheaper than Steel, and Considered More Durable—Structures Watertight

CONCRETE has been used for years as a lining for reservoirs and underground tanks, but its comparatively low tensile strength prevented its use for holding fluids under any considerable head until the practicability of reinforcing it with steel to serve this purpose was proved. Even when reinforced, however, some boldness was required to use it for constructing a standpipe. But at least three have already been built, and with such success that others may be expected to follow. Probably the greatest drawback to the use of reinforced concrete for such structures is that, unless a very high factor of safety be employed, the steel reinforcement will elongate beyond the elastic limit of the concrete, and the latter will crack sufficiently to cause leaks. The only cure apparent for this is to line the standpipe with a more or less flexible waterproof covering. If, while the concrete is being placed and is hardening, the reinforcement could be put under the tension it will be required to sustain in service, a solution would be offered, but this seems impracticable.

THE FORT REVERE STANDPIPE

Probably the first concrete standpipe to be constructed was that at Fort Revere, Hull, Mass. This was built for the U. S. Army in the fall of 1902 by Mr. R. Baffrey, of New York City, by whom it was designed. The standpipe proper is circular in plan, 20 feet internal diameter, and 50 feet high, and enclosing this is a tower, octagonal in plan, 33 feet wide at the base and 84 feet high, constructed largely of reinforced concrete and buff-colored pressed brick. The foundation, which is common to both tower and standpipe, is five feet deep, composed of 1:3:5 Portland cement concrete, which is reinforced with ¼-inch rods, running in two directions and spaced 4 inches apart, more to resist temperature cracks than for strength. The shell of the standpipe is 6¼ inches thick at the bottom and 3¼ inches at the top, and is constructed of concrete, composed of one part Portland cement, two parts sharp sand and four parts coarse gravel, not exceeding one inch diameter. The reinforcement consists of vertical 5-16-inch steel rods spaced 8 inches between centers, in two consecutive circles 2 inches apart. To each circle of rods were fastened by wire a number of rings composed of ½-inch steel rods, which were spaced 1¾ inches apart vertically at the bottom, this interval being gradually increased to 7½ inches at the top. The angle between the bottom and sides was also reinforced with 3-8-inch rods 3 feet 4 inches long and placed radially about 8 inches apart.

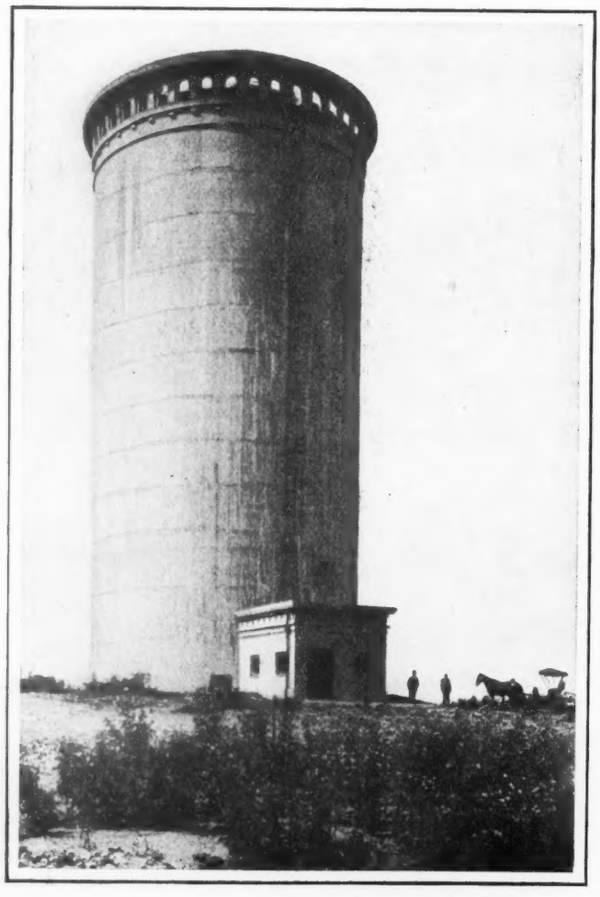
The whole inner form for the shell was built in four tiers of eight segments each, with horizontal plank ribs and vertical lagging, all rigidly braced and tied together. The outer form was composed of posts about four feet apart, which also served as part of a scaffolding, against

TOWER AND STANDPIPE, FORT REVERE, HULL, MASS.

which were placed horizontal boards bent into contact with the uprights, and carried up a little in advance of the concrete. The interior surface of the concrete was given three coats of Portland cement mortar after the forms were removed, these coats having a combined thickness of one inch. This standpipe, since being filled, has shown no leak, nor even sweating. Its cost was less than was bid for a steel standpipe.

The Milford Standpipe

This standpipe was designed and built at Milford, O., in 1903 by J. L. H. Barr, of Batavia, O. It is 81 feet high from base to roof, and has an outside diameter of 15½ feet. The shell is 9 inches thick at the base, and for thirty feet above, where it offsets on the inside to a thickness of 7 inches; at a height of 55 feet it was again reduced to a thickness of 5 inches, which was continued to the top. The foundation was made 6 feet deep, of 1 cement to 7 clean river gravel, the gravel containing 40 per cent. sand and 60 per cent. pebbles of diameters up to 4 inches. On this were laid 1x1x⅛-inch T bars, radiating to within 6 inches of the outer edge and covered with a 6-inch layer of 1:3 mortar. The shell also is built of 1:3 mortar, reinforced with 1x1x⅛-inch T bars, placed 3 inches from the outside surface. These bars were placed vertically in the shell 18 inches apart, and supported rings of the same shaped steel, which were fastened to them by clamps at each intersection. The rings were spaced 6 to the foot for the lower 30 feet, 5 to the foot for the next 25 feet, and 4 to the foot from there to the top, lapping 3 inches at each joint, where they were bolted together. The forms, both inside and outside, consisted of 3x1⅛-inch flooring cut into 3-foot lengths and nailed to circular ribs made of 4x4 timber. The forms were made in segments, eight to a circumference, and three sets were used. The shell rose at an average rate of 5 feet per day, and the cement of one batch did not harden before fresh was placed in contact with it. About 25,000 pounds of steel were used, 270 pounds of cement, 68 cubic yards of gravel, and 90 cubic yards of sand. The cost was about $200 less than the lowest bid for a steel standpipe of the same dimensions.



ATTLEBORO, MASS., STANDPIPE COMPLETE

The Attleboro Standpipe

The Attleboro, Mass., standpipe was built to replace a wrought-iron standpipe 30 feet diameter and 125 feet high, which was considered too small, and was being badly corroded. F. A. Barbour, of Snow & Barbour, the Engineer, recommended this construction because of the character of the water, which rapidly attacks steel; because of the large size of the tank desired, which called for the almost prohibitive thickness of steel plates of 1¾ inches; because of the greater artistic possibilities inherent in a concrete structure, and because of less cost of operation and maintenance than for a steel tank. The bid accepted was that of the Aberthaw Construction Company, of Boston, for $34,000, which was about $3,100 less than the lowest bid for a steel standpipe.

This standpipe is 50 feet inside diameter and 106 feet from the inside bottom to the top of the cornice. The shell is 18 inches thick at the bottom and 8 inches at the top. The whole is covered with a Gustavino tile roof. In the concrete are embedded steel bars, both horizontal and vertical, forming rectangular lattices. In the shell, for a height of 60 feet from the bottom, were placed two rows of 1½-inch round bars; above these for the next 21 feet a single row of such bars was placed, and above this to the top 1⅛-inch bars were used. The vertical spacing between bars increased gradually from 3¼ inches at the bottom to 8 inches at the top. These bars were delivered in lengths of 56½ feet, three making a complete ring with 30-inch laps at the ends, where they were fastened together by three Crosby guy-rope clips to each splice. The rings were supported rigidly in place by fifteen vertical 4-inch channels, to which they were attached. The splices in the rings broke joints 5 feet, always in the same direction. In the bottom of the standpipe was a grillwork of ¼-inch bars spaced 6 inches apart in each direction.

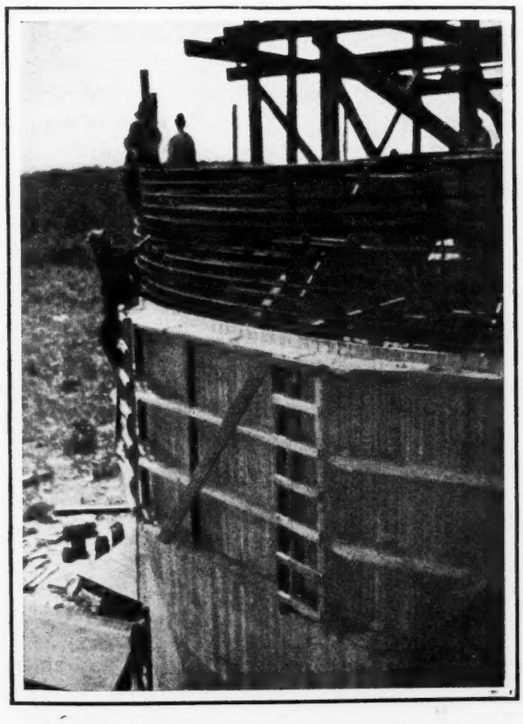
Soft Steel Preferable

The steel used was .40 carbon, elastic limit 50,000 pounds, ultimate strength 80,000 pounds. The design provided for a maximum tension of 18,000 pounds. From the experience had in this standpipe it was concluded that a softer steel, which could be more easily handled and placed in position, would be preferable, and that a lower working stress should be used to reduce cracking of the concrete. The cement used was Atlas Portland.

Briquettes of 1 cement to 3 sand had an average strength of 266 pounds after 7 days and 358 after 28 days, and but 1 per cent. remained on the 100-mesh sieve and 14.5 per cent. on the 200 mesh. The sand had an average effective size of .30 mm. and a uniformity coefficient of 5.6. The stone was very hard, with a specific gravity of 2.68, and after crushing was separated into three sizes, the finest being discharged into the sand bin. Daily mechanical analyses were made to permit of so mixing the materials as to secure the densest possible concrete. The average mixture was about 1 :2 :4.

The floor of the tank was one foot thick, and this and about 2½ feet height of shell were made as a monolith, and given a troweled granolithic sidewalk finish. The steel uprights and rings were then set in place for about 7 feet in height, and wooden forms set about 7½ feet high, these forms being made in sections about 11 feet long. The outer lagging was vertical; the inner boards were horizontal, and were placed one board at a time and kept just above the concrete. Concrete was deposited in four places around the circumference at once, and the 7½ feet were filled before stopping. At the top a 2x3-inch beveled wood tongue was put in the middle of the shell to form a groove. Before again placing concrete the top surface was thoroughly scrubbed with water and then, including the groove, thoroughly plastered with neat cement. As it took three days to place each 7½-foot tier of steel and forms in position, the old concrete was hard before any new was placed on it. The concrete was raised by a derrick (which was carried by a central timber tower, built first 60 feet high and afterward extended), deposited between the forms and thoroughly rammed and spaded.

The shell contains 770 cubic yards of concrete and 185 tons of steel. The cost of the concrete per cubic yard was: Cement, $4.80; sand and stone, $3.90; mixing, $0.40; placing, $2.20; work on forms, $2.65; a total of $13.95.



ATTLEBORO STANDPIPE, SHOWING REINFORCEMENT

It was found that if the concrete was too wet to support the aggregate, the stones were driven to the bottom of the batch by spading and ramming, and a porous place caused there. The forms also were too light, and the means employed for holding them in place not sufficient, so that they occasionally moved slightly while concrete was being placed, which consequently settled away from the steel bars. The Engineer and contractor both believe that mortar only, or mortar and fine gravel, would be preferable to concrete for such a structure, which would increase the cost 2 to 7 per cent., depending upon the mixture.

When the tank was about 20 feet high water was admitted, and was kept about 20 feet below the working surface as this rose. There were numerous small leaks, but only two which squirted beyond the wall, and these became less with time. This before any plastering had been done. As winter set in before the walls were completely plastered, it was decided to use them with but one coat, and the standpipe was filled and used from December 27, 1905, to May 15, 1906, during which time there was a trifling leakage, which was sufficient, however, to cause some scaling off of the outer cement, due to freezing. Beginning May 15, 1906, five additional coats of plaster were applied to the bottom 25 feet, but with no diminution in leakage. Five coats of the Sylvester solution were then applied, with the result that only one small damp spot appeared on the outside of the tank.

REPAVING OVER EXCAVATIONS

Reinforced Concrete Used for Foundations in Easton, Pa. —Additional Cost and Amount of Material Required

By JOHN McNEAL, Jr., M. Am. Soc. C. E., City Engineer

THE many depressions on the brick-paved streets of our city, due to the constant digging up of the streets by the several corporations and local contractors, has brought quite forcibly to my attention the necessity of providing some means for protecting the surface of the street from gradual settlement below the general level of the adjoining paving. Experience has proved that, no matter how carefully the back filling of a trench is done, there is bound to be a settlement of the earth replaced in the trench. In some cases this settlement has not begun to show for a year or more after the paving has been replaced.

While trying to devise some means of overcoming this difficulty I noticed in a recent number of the MUNICIPAL JOURNAL an article prepared by R. C. Huston, M.W. S.E., on "Reinforced-Concrete Pavements," describing the use of reinforcing metal in concrete foundations over filled trenches. The idea seemed a good one, and I de-

cided to adopt its use in all trenches excavated and refilled on the brick-paved streets of our city.

The article referred to states: "If, in the opinion of the City Engineer, it is deemed necessary to reinforce the concrete foundation over filled trenches, the contractor shall furnish and place under the direction of the City Engineer, expanded metal of not more than 3-inch mesh and No. 10 gauge steel. The cross-section area of same shall not be less than .185 square inch per one (1) foot in width."

To the above requirements of expanded metal for a trench not more than 20 inches in width, I have added: "After the trench is properly back filled, the old concrete shall be removed for a distance of at least one foot beyond each side of the trench, and expanded metal placed over the entire opening. Six inches of concrete, mixed in the proportion of one part of Portland cement, three parts of sand, and five parts of broken stone, shall be placed over and around the expanded metal in such a manner that the metal shall be imbedded in the concrete 1½ inches above the base or 4½ inches below its surface. After the concrete is thoroughly rammed to an even surface 2 inches of sand and the vitrified bricks are to be replaced on the surface of the concrete to conform with the adjoining paving."

These specifications met with some opposition from the corporations that are constantly digging up the paved streets for new mains or repairs, and one corporation refused to place new mains on any of the streets where the reinforcing metal was required. A great many trenches have been protected in this way, however, the local contractors, as well as the corporations, with the single exception noted, complying without opposition. While the trenches have not been protected in the above-described manner, for a sufficient length of time to prove the efficiency of the metal, I have great faith in the anticipated result.

The following is the approximate cost of repairs to an open trench 20 inches in width:

Removal of old concrete for a width of 12 inches on each side of opened trench, about one-half cent per square foot; expanded metal of 3-inch mesh and No. 10 gauge steel, cross-section area, .185 square inches per 1 foot in length, 4½ cents per square foot; concrete, mixed in proportions as specified, 10 cents per square foot; cost of sand and bricks vary in accordance with local conditions. The above figures show the cost of replacing the pavement foundation with reinforcing metal to be 37½ cents per lineal foot of trench higher than that of plain concrete. This cost seems high, but the figures are based on the cost of service trenches of about 10 feet in length, where it would naturally be higher than on large contracts of continuous trench.

Assuming the working strength of the steel to be 20,000 pounds per square inch, and allowing for the shape of the metal, which distributes the load over twenty inches of trench, a wheel load of 670 pounds would be safely supported, even if the backfilling had settled away from the foundation.

SEPTIC TANKS AT BIRMINGHAM

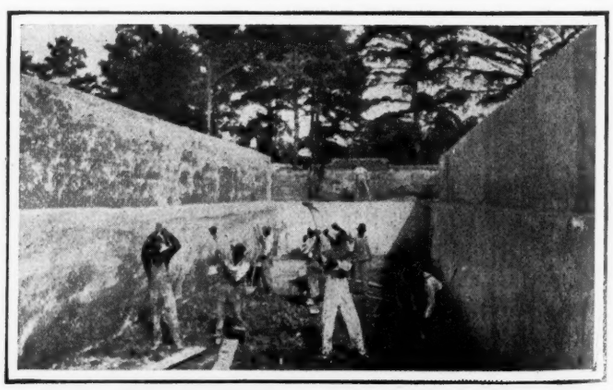
Description of County Sewerage System Which Serves Alabama City and Contiguous Territory—Cost of Plant—Other Data

BIRMINGHAM, ALA., is situated in the heart of the iron district of Alabama, and is connected by trolley lines with twelve incorporated towns. It has within its corporate limits a population of about fifty thousand, and the territory traversed by its trolley lines has an additional population of about one hundred thousand. These municipalities are situated in what is known as "Jones Valley." However, Birmingham and her suburbs extend into two sub-valleys, each valley being drained by a creek. The dry-weather flow of each of these creeks is about ten million gallons per twenty-four hours. These creeks having become polluted by sewage to such an extent as to create more or less of a nuisance, the county decided to build trunk sewers and to arrange for the final disposal of the sewage of Birmingham, the suburban towns and contiguous territory.

For this purpose the State Legislature created the Jefferson County Sanitary Commission, which is composed of business men serving without compensation. The Commission elects members to fill any vacancies that may occur in the same, either from resignation, expiration of term or other cause. This Commission was given the power to issue and sell five hundred thousand dollars worth of County Sanitary Bonds and to apply the proceeds to the construction of trunk and branch sewers and works for the disposal of sewage. There was also set aside a certain percentage of the county taxes each year, to be applied to paying the interest on the bonds and for maintaining and operating the sewers and disposal works.

THE TRUNK SEWERS

Two trunk sewers have been constructed—the one in Valley Creek valley is about fourteen and three-fourths miles long, from 48 inches to 63 inches inside diameter with falls varying from one to one and seven-tenths feet per thousand. In Village Creek valley a trunk sewer about eleven and three-fourths miles long has been constructed, the sizes varying from 18 inches to 36 inches inside diameter, with falls ranging from one foot per



SEPTIC TANK UNDER CONSTRUCTION—BIRMINGHAM, ALA.

thousand to three and one-third feet per thousand. Several branch sewers have been constructed from these trunk lines, and several are now being constructed. Under all trunk sewers and some of the branches, six and eight-inch sub drains of No. 2 vitrified pipe were laid with uncemented joints.

The Septic Tanks

At the lower end of the Village Creek trunk sewer two small septic tanks have been constructed, and during the past twelve months sewage from a population of about ten thousand people has been passing through them. At the end of the Valley Creek trunk sewer six septic tanks have been constructed, and the sewage from a population of from fifty thousand to sixty thousand people has been passing through them for about twelve months. This is, therefore, believed to be the largest septic tank plant in the country. At this plant the sewage first enters a circular grit chamber twenty feet in diameter and ten feet deep. From the grit chamber the sewage flows to the septic tanks through a 36-inch brick sewer. A by-pass is provided so that the sewage can be diverted around the grit chamber, and there is also a drain from the bottom of the grit chamber, all of which are controlled by suitable valves. Screens are also provided at the entrance of the grit chamber for removing the coarse material.

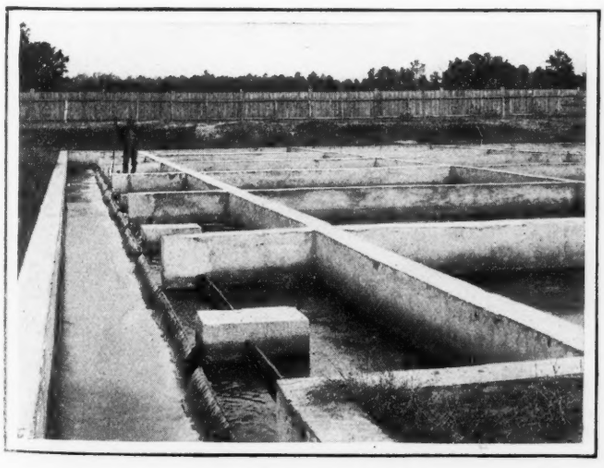
There are six septic tanks, each 100x20x10 feet deep. The sewage flows along the upper end of the tanks in a flume four feet wide and four feet deep. Two 12-inch valves are provided for each tank, through which the sewage passes from the flume. The sewage enters the tanks proper through a 2-inch slot, extending the entire width of the tank. The effluent is discharged over weirs extending entirely across the tanks. Each tank is provided with three reinforced concrete baffle boards, which extend three feet and three inches down into the sewage. Sludge pipes and valves are provided for cleaning out the tanks. The effluent is discharged from the tanks over the weirs into a concrete flume four feet wide and four feet deep extending along the lower end of the tanks. After flowing in this flume for about eight hundred feet, the effluent falls about nine feet over a series of weirs to a 24-inch discharge pipe—this pipe having been placed at this depth in order to act as a drain for the filters, which it is proposed to install at a later date. From this drain the effluent is discharged over a ledge of rock into the creek.

The combined capacity of these tanks is about one million gallons, and it was estimated that the dry-weather flow of the sewage reaching them in the near future would be about four million gallons, thus giving a six-hour period for remaining in the tanks. At present, the dry-weather flow is about three and one-half million gallons.

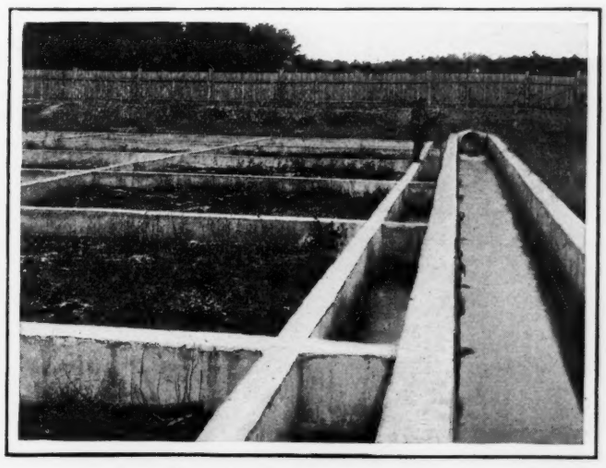
As an experiment, an eight-inch pipe was laid along the three-foot sewer from the grit chamber to the first septic tank, and an arrangement was made in the grit chamber so that the sewage entering this pipe would be taken from the bottom of the grit chamber. The valves were closed so that no other sewage could enter this tank, and the various valves were so arranged that, as near as could be judged, the flow over the weir from this tank was half of what was passing over each of the other weirs—the intention being to run into this tank the heavier sewage from the bottom of the grit chamber and have it remain in the tank twice as long as the other sewage, the idea being that, while the flow of sewage was comparatively small, such a separation might be made, and if it proved of any value a larger reservoir could be constructed in the future, from which the sewage could be decanted to the septic tanks. The sewage that flows into this pipe apparently is darker and thicker than the remainder of the sewage. The valves and pipes are so arranged that by the use of boards at the weirs sewage can be drawn from the bottom of any tank and discharged through any other tank.

Action of the Tanks

The tanks are not covered. The formation of the scum has been somewhat irregular; at times the entire tanks will be covered with scum several feet thick, which would bear the weight of a man. This would disappear entirely from certain bays in a tank, whilst it would remain undisturbed in other bays of the tanks. A large percentage of this irregular movement of the scum is attributed to the unusually wet weather, there having been



DISCHARGE WEIRS, SEPTIC TANKS, BIRMINGHAM, ALA.



INTAKE, SEPTIC TANKS, BIRMINGHAM, ALA.

more rain and heavier storms during the past summer than were ever known before.

The only odors that have so far developed around the tanks have occurred after several days of warm rain when the atmosphere was sultry. Even at such times the odors would be comparatively slight and not discernible at any distance from the tanks. The effluent is comparatively clear, although at times there has been considerable black, granulated matter discharged over the weirs.

In the early summer there was quite a pest of flies around the tanks, so much so that it was disagreeable to be near them. A little slaked lime was sprinkled over the scum, and in a short while the flies disappeared and have not returned. When maggots have been observed forming in the scum a little lime has been added from time to time. The lime had apparently no effect upon the scum.

It has been observed that if, from any cause, the entrance slot became clogged the discharge over the weirs would practically cease almost immediately opposite this stoppage, and by drawing a hook, which is kept for the purpose along the slot in the tank, the flow over the weir would almost immediately become uniform. This would seem to emphasize the necessity of having the sewage enter and leave the tank for its full width.

The creek into which the effluent from the tanks is discharged has a dry-weather flow of about eleven million gallons at this point. There is considerable deposit in the bed of the creek near the outlet, and it is evident that decomposition is in progress there, although there are no odors, and a short distance below the outlet the creek has resumed a normal appearance.

COST OF THE PLANT

The county, up to the present time, has expended $475,000 on the main sewers, branch sewers and disposal plant. Of this amount $25,000 was paid to the county by a company in return for the right to the use of the effluent from the disposal works, this $25,000 being the cost of the septic tanks in the larger plant. It is proposed by this company to use the effluent from these works as a supplement to their water supply, to be used in the manufacture of iron, coke, steel, etc. Under this agreement, the county was to be paid the cost of the septic tanks, and each year a bill was to be rendered to the company for the cost of the maintenance and the cost of constructing any additional means for treating the sewage or the effluent from the tanks. In case the company fails to pay any one of these bills on presentation the contract is canceled, the company losing all amounts previously paid in.

The sewers and septic tanks were designed and constructed under the supervision of Julian Kendrick, who has been Chief Engineer of the Jefferson County Sanitary Commission since its organization. He is also City Engineer of Birmingham, and we are indebted to him for the information contained herein, obtained through his courtesy by our representative at the convention of the American Society of Municipal Improvement.

REPORTS ON STREET PAVING

Committee of American Society of Municipal Improvements Gives Review of the Year's Progress—Wood Block and Bitulithic

THE most important statements made by this committee, of which James Owen, of Newark, N. J., was chairman, before the American Society of Municipal Improvements at Birmingham, Ala., were that the general tendency was toward the abolishing of pavement guarantees (which tendency they wished to encourage); that asphalt pavements were used much less than formerly, their place being taken by bitulithic and wood block and that the asphalt pavements now laid were poorer than the original ones, while a better class of brick pavements was being laid than a few years ago, and that the wood pavements now laid were greatly superior to those which caused so much trouble and financial loss thirty years ago. We quote the most significant sentences of the report:

"The responsibility for good construction and maintenance is being gradually placed upon City Engineers. Where a city depends upon a guarantee or bond, the legal department waits till a pavement has become useless, and then tries to collect cash damages. The people would prefer to have a pavement on the street rather than a bond or cash damages. Your committee recommends that pavement guarantees be gradually abolished and that City Engineers be made responsible to secure the best pavements of various kinds called for on different streets and roads."

"Hydraulic cement concrete foundations have ceased to be roughened by the bad methods of chipping them with picks, or by partial incomplete tamping, so as to leave coarse stone projecting above the mass of concrete. One method cracks the concrete . . . the second method . . . leaves voids in the concrete by failing to tamp it until all the voids are filled. The best practical method . . is to tamp the concrete until free mortar appears over the surface, then to immediately scatter or spread thereon a thin layer of clean broken stone about two inches or a little less in size, and tamp the stone about half its depth into the soft surface of the concrete."

"The asphalt industry is now somewhat broken up. There are several sources of supply and several companies and contractors laying these pavements. The result is cheaper and poorer work. . . . Excessive repairs and resurfacing of asphalt pavements, especially of those which decay, now fall on cities, guarantees or periods of free repairs having elapsed."

"There are now about 1,000,000 square yards of treated wood block pavements in a little more than fifty cities of the United States." Bitulithic pavement "is now laid and being laid in about 131 cities, with an aggregate of about 5,698,000 square yards."

"Brick pavements for many years were their own worst enemies, because of weak bricks and poor construction. During the past few years strong efforts have been made by some cities and by several makers to increase the

requirements of the specifications and tests of paving bricks, so as to secure pavements better able to resist the action of weather and traffic. A reasonable degree of success is attained in some cities, especially where complete specifications, containing fully defined, technical tests, followed by a thorough inspection during construction, is the rule of procedure."

Concerning wood for use in wood block pavements, F. A. Kummer, Manager of the U. S. Wood Preserving Company, reported that long-leaf yellow pine has been used almost exclusively for the best grade of wood paving blocks. The price of this has increased more than 50 per cent. during the past six years, which means an additional cost of more than thirty-six cents per square yard for four-inch blocks. Moreover, the best grade of wood is almost unobtainable. It is, therefore, very desirable to ascertain whether some other more abundant timber will not give equally good results. By an arrangement between the Department of Agriculture, the Kettle River Quarries Company (manufacturers of wood block), and the city of Minneapolis, there is to be laid in that city an experimental section of pavement containing several kinds of wood, including Norway pine and tamarack. Arrangements are now being perfected for a similar test in New York by the U. S. Wood Preserving Company of shortleaf pine, topelo, loblolly pine, maple, sap gum, scrub pine and scrub oak. Not only different woods, but different methods of construction are to be tried, such as the use or not of a sand cushion, best form of joints, etc. This latter company has laid in New York quite a little black gum from Norfolk, Va., and this wood is now allowed by the specifications of the Bronx and Queens, New York, and Cincinnati, O., in the first of which about 60,000 square yards is now under contract. This wood is also being used in Bridgeport, Conn., Holyoke, Springfield and Boston, Mass., and Baltimore, Md.

Assuming that by proper treatment all decay can be prevented, then the serviceability of any wood depends upon its density, toughness and hardness against the travel it is to be subjected to. If this travel be light, a softer wood can be used than for a street of heavy traffic. Present experience would seem to indicate that a wood pavement undergoes practically no wear until subjected to a certain maximum amount of travel, but when that point is reached it rapidly goes to pieces. On streets of light travel—carriages and delivery wagons only—almost any thoroughly preserved wood will have an indefinite life. Under medium traffic woods as soft as Norway pine have given excellent results, but under heavy traffic it would be risky to lay anything less resisting than the best quality of long-leaf pine, and the writer knew of no other wood except black gum which could be used under such conditions, which was commercially available. A too hard wood, like mahogany (used in Havana) or the Australian woods used in London, is too slippery. The writer thought that scrub oak would split too much under treatment, maple be too slippery, and the inferior grades of pine be too soft for the heaviest traffic. Oregon pine is an ideal wood for paving blocks, but the freight rates prohibit its use east of the Mississippi.

In general, the desirable characteristics for paving block wood are density, homogeneity, toughness rather than hardness, resistance to splitting under treatment, and abundance at reasonable prices.

J. W. Howard stated that the foundation of a bitulithic pavement could be cement or bituminous concrete, or could consist of an old macadam, cobble or stone block pavement, or the foundation of an old brick or asphalt pavement. Concrete, he said, should never be coated with bituminous cement or bitumen, as this tends to work upward and soften the bitumen in the pavement.

Severe Test of Asphalt Pavement

A REMARKABLE instance showing how a high-grade asphalt laid in the form of a pavement was unaffected by water occurred in connection with the asphalt pavements in Brooklyn, N. Y. On Morgan avenue a pavement was laid with Bermudez asphalt in July, 1904, by the Eastern Bermudez Asphalt Paving Company. About midway of this strip, where Ten Eyck street leads into it, there is no sewer inlet to permit the surface water to be drained off from the street. That portion of Ten Eyck street leading into Morgan is little more than an alley at present, which may account for the negligence on the part of the city in not providing suitable drainage. Whenever it rains, therefore, the water runs down Ten Eyck street, filling it from the crown to the curb, where it stands until evaporated or until the next storm. Sometimes the storms are so heavy that a stream of more than ordinary force rushes down Ten Eyck street or alley, and so across Morgan street, and has occasionally washed away portions of the land on the other side of Morgan street. An expert engineer who examined this pavement to ascertain whether it was affected by water or not, found a considerable portion of Morgan street just at this point covered with standing water which apparently was slowly evaporating. He asked a nearby resident how often the street had been totally dry, to which was replied: "The street has not been dry for nearly two years, so far as I know, and I have seen it nearly every day. It has been in the condition you see it nearly ever since it was laid." The expert made a careful examination of the surrounding pavement and as far as possible of the pavement under the water, and was unable to detect any signs of disintegration, which seemed to be very good evidence that Bermudez asphalt was unaffected by water. This is but another instance corroborating the statement of Prof. Dow that the Bermudez asphalt pavements laid in Washington, D. C., had never rotted or shown the slightest inclination to rot under the influence of water.

Municipal Waterworks for Denison

DENISON, TEX., citizens, claiming that the water company will not take steps to provide a supply adequate in amount to the needs of the city, and that such a supply is available, decided in a public meeting on November 23 that municipal works were desirable, and appointed committees on ways and means, legislation, cost, and source of supply. A storage reservoir has been located and pronounced feasible.

MUNICIPAL ELECTRIC L GHTING PLANT

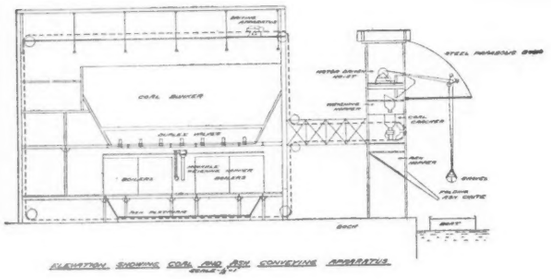
Newark, N. J., to Have a Most Complete System—Estimated Cost of Construction and Maintenance—Other Data

A Special Committee of Lighting appointed some months ago by the Common Council of Newark, N. J., to consider the question of a municipal electric lighting plant, has received the report of Mr. F. O. Runyon, of Runyon & Carey, on the cost of installing and operating such a plant, suitable for supplying electric current for public buildings and street lighting, and which can be extended to supply light and power to private parties if desired.

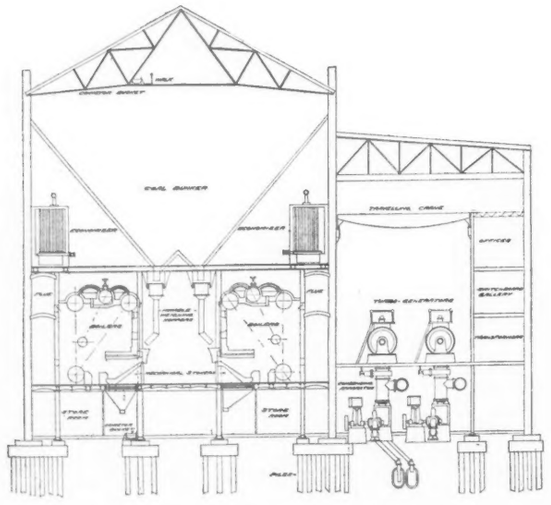
Location and Description of Stations

Two locations were considered, one on the grounds of the present Belleville Pumping Station on the Passaic River at Belleville, N. J.; the other on the "City Dock" property, located on the Morris Canal and Passaic River; although the use of the latter is probably estopped by the terms of the deed conveying it to the city. The former property affords more space, but is further from the city's center. Private dock property was considered too high-priced for this purpose.

After estimating costs of installation and operation by each of five systems, using from four substations to none respectively, that calling for three centers of distribution was found most economical; the power-station constituting one of these if located on the City Dock property.



ELEVATION SHOWING COAL AND ASH CONVEYING APPARATUS



—ELEVATION THROUGH BOILER AND ENGINE ROOM—
—FOR—
—PROPOSED MUNICIPAL ELECTRIC LIGHTING PLANT—
—FOR—
—NEWARK, N.J.—
—RUNYON AND CAREY—
—CONSULTING ENGINEERS—
—NEWARK, N.J.—

The power station is designed to be of steel frame which offers open fairways and convenience in handling machinery, coal and ashes; the floor to be of reinforced concrete; all foundations of building and machinery to be on piles; the walls to be brick and terra cotta; the frames and sash of iron; the glass wired. The boiler room walls would be lined with glazed brick to facilitate avoiding the accumulation of dust; and good ventilation, baths, closets, etc., are provided. The substations would be small brick buildings on 25x75-foot lots.

Mechanical Equipment

The steam plant comprises coal and ash conveying apparatus, coal bunkers, automatic stokers, boilers, economizers, forced draught apparatus, stack, pumps, and auxiliary apparatus; besides which are the engines, generators and auxiliary apparatus. Conveying apparatus is provided by which coal, delivered by boat, may be taken from the hold by clam-shell bucket hoist and deposited in a weighing hopper, from which it passes to a bucket conveyor which carries it to bunkers over the boiler room, where it is dumped automatically. (See illustration.) Each boiler has an automatic stoker, to which coal is delivered from the bunkers, passing through a weighing hopper on the way. The coal bunkers are of steel and reinforced concrete, with a capacity of 3,000 tons, or about 90 days' supply. The boilers are water-tube. With induced draught the plant could burn low-grade coal in case of necessity, such as a strike. The stack would be 175 feet high and 10 feet inside diameter, of radial brick or concrete.

Steam turbines are recommended in preference to reciprocating Corliss engines (the only other type considered), because of superior economy under the conditions likely to obtain in this plant. Among other considerations, the turbines occupy but one-fifth as much space as a Corliss engine, and do not require such heavy foundations.

The electric generators direct-connected to the steam turbines are to be 6,600-volt to 13,000-volt, 3-phase, 60-cycle alternating current machines.

Distributing System

This would include 40,000 feet of subway if the power station were at the city dock, or 58,500 if it were at Belleville. Extensions of the subway at the rate of 2,500 feet a year are estimated. A vitrified clay multiple-duct conduit would be laid on concrete, with concrete at the joints; manholes of brick or reinforced concrete being spaced 500 or 600 feet apart. The overhead construction would cover the rest of the city, but over most of this area the poles of private companies would be used under an old ordinance providing for such use upon the payment of rental. The rent now paid by private companies is 20 cents a year for each No. 2, 4, or 6 B. & S. gauge wire, 10 cents for each incandescent lamp, 50 cents for each arc lamp, 10 cents for each switch, and $1.00 for

each transformer. The number of new poles to be provided would be about 2,500.

Capacity and Cost of Construction

On December 31, 1905, Newark was using 2,154 arc lamps and 170 incandescent lamps. It is estimated that the number will be increased at least 1,000 during the next 10 years. It is assumed that the present requirement is for 1,562 kw. for 2,200 arc lamps, 25 kw. for 200 incandescents, and 100 kw. for the public buildings, of 1,687 kw. total; which could be economically handled by three 750 kw. units, one to be reserved for emergency or alternate service; but three 1,000 kw. units are recommended, to allow for emergencies and growth. These would supply 4,225 lights; and the station will permit expansion sufficient to supply 7,000 arcs, which will meet all requirements for years.

The costs of the alternative plants are estimated to be as follows:

	Power Stations located at Belleville.	City Dock.
Power Station Property, Value	$5,000.00	$50,000.00
Substation Property	3,000.00	2,000.00
Power Station and Stack	225,000.00	225,000.00
Substations	12,000.00	8,000.00
Dock Improvements	6,000.00	.....
Coal-conveying Apparatus	26,000.00	26,000.00
Boilers, Stokers, Steam Fitting, etc.	118,000.00	118,000.00
Turbo-Generators	98,000.00	98,000.00
Switchboard and Electrical Apparatus	17,000.00	16,000.00
Underground Cable	72,000.00	26,000.00
Subway	115,000.00	75,000.00
Overhead Construction	96,000.00	96,000.00
Total	$793,000.00	$740,000.00
Engineering Services, 5%	39,650.00	37,000.00
Total	$832,650.00	$777,000.00

Cost of Operation

This includes Interest on Investment, Depreciation of Plant, Taxes, and Maintenance of Plant. Four per cent. 30-year bonds are assumed; with 2 per cent. annually for the sinking fund this gives 6 per cent. per annum.

Interest, Sinking Fund, Depreciation and Taxes

			Belleville	City Dock
Interest and Sinking Fund, 6%			$49,959.00	$46,620.00
	DEPRECIATION			
Item		Rate		
Power Station and Stack		3%	$6,750.00	$6,750.00
Substations		3	360.00	240.00
Dock Improvements		10	600.00	.....
Coal Conveyor		5	1,300.00	1,300.00
Boilers, Steam Fittings, etc.		10	11,800.00	11,800.00
Turbo-Generators		5	4,900.00	4,900.00
Switchboard and Electric App.		5	850.00	800.00
Underground Cable		4	2,880.00	1,040.00
Subway		1	1,150.00	750.00
Overhead Construction		10	9,600.00	9,600.00
Engineering		5.07	2,010.00	1,857.00
	TAXES			
	Assessment Rate	Tax Rate		
Property	100%	2%	160.00	1,040.00
Improvements	50	2	5,417.00	5,280.00
Outside Construction.	100	2	5,660.00	3,940.00
Total			$103,396.00	$95,917.00

Comparison of these rates of depreciation with those given last week show the former to be much the higher, and hence on the side of conservatism.

Maintenance

For this purpose $35,560 per year is allowed for 33 employees, the salaries ranging from $2,500 to $550 a year. Coal is estimated at $3.15 a ton and 2 cents for conveying to bunkers; or $10.23 per arc light for the City Dock station and $10.74 for the Belleville plant. For oil and waste, repairs and supplies $22,975 is allowed, which we consider reasonable.

It is assumed that 2,500 feet of subway will be added each year, to cost $5,500, and that the extension of overhead connection will cost $3,200 and increase in substation equipment $750 a year. These, with an increase of 100 arc lamps, 10 incandescents and 20,000 kwh. for public buildings each year, will cause a yearly increase in the annual expenses of $11,660.00. On the basis of the above it is estimated that arc lights will cost $71.83 per year in 1907, gradually decreasing to $59.76 in 1916, if the power station is at Belleville. The price now paid is $95; if this were continued for ten years it would amount to $1,054,090 more than the estimated cost of the municipal plant during that time.

On the whole the estimate seems to have been a conservative one. The cost of plant is based on preliminary bids, which would probably be reduced by competition. Interest, sinking fund, depreciation and taxes are all included, some of which, especially the last, are omitted from most estimates. Of the 1907 cost of arc light, $19.46 is for interest and sinking fund, $16.44 for depreciation, and $4.96 is for taxes.

For purposes of comparison with the above we give a few recent figures.

The New York commission in 1905 estimated the cost of municipal lighting in that city at $64.07 a lamp, of which depreciation was $17.21 (at 6 per cent.) and interest (at 3½ per cent.) was $12.29; taxes were not included. Chicago's lights last year cost $56.23 each, exclusive of interest, taxes and depreciation; there being 5,743 lamps in all. Detroit's municipal plant cost, for 2,812 lamps, $34.99 each, plus $12.34 for depreciation, $9.50 for interest, and $2.51 for taxes, a total of $59.34. The new municipal plant at Columbus, O., is reported to furnish arc lights at $49 each, including 4 per cent. interest and 5 per cent. depreciation.

Leadite Pipe Joints in Atlantic City

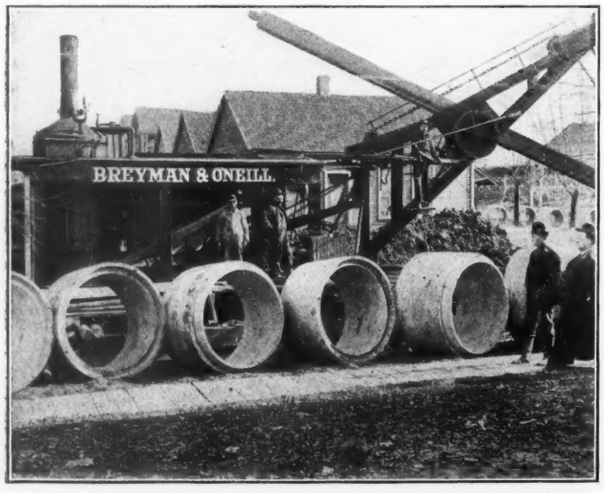
Mr. Kenneth Allen, in his annual report as Engineer and Superintendent of the Atlantic City, N. J., Waterworks, states that "the use of leadite in place of lead for making pipe joints has been tried, so far with satisfactory results. This, which is understood to be composed of iron filings, sulphur, slag, and salt in certain proportions, costs twice as much per pound as lead, but as it weighs but one-sixth as much the cost per joint is but one-third that of lead. In addition to this no caulking of the joint is required, which effects a further saving. This material is now used by the Water and Filtration Bureaus of Philadelphia, and the Water Departments of Buffalo and Troy, N. Y., and if as serviceable as it appears to be, will effect a considerable economy in our street work."

CONCRETE SEWER PIPE

Successful Installation of Large Drain at Toledo, O., Under Unfavorable Sub-soil Conditions—Method of Work

IN the city of Toledo, O., there has recently been completed a large trunk sewer, two thousand feet of which was built of reinforced-concrete pipe. This particular type of construction was chosen to meet certain conditions existing along Valley street, where the sewer was laid, it being traversed in part by a running stream with quicksand at the bottom. Mr. F. T. Consual, Chief Engineer of the Board of Public Service, was of the opinion that reinforced-concrete pipe would have an advantage over the monolithic concrete or brick construction which it was proposed to use in the dry sections of the trunk sewer. As was anticipated, the bottom of the trench was very treacherous, being a stratum of quicksand and water which would have made other materials difficult to handle. Mr. Consual states that the pipe has been satisfactory in every way and has exceeded his expectations in workmanship and strength.

In the process of conducting the work the pipes, three feet in length and 48 inches or 54 inches in diameter, were made along the line and above ground, as shown in the illustration. The concrete for the pipes was composed of one part Portland cement, two parts clean Lake sand and three parts of crushed rock. In manufacturing the pipe the inner wall of steel was first set up on the upper and inner flange of the bottom plate or ring; then lateral reinforcing bars, disposed at right angles to the diameter, were inserted in pockets in this ring. Next the outer wall of steel sections was assembled on the lower and outer flange of the bottom plate, and space clips at the top of this wall held the reinforcing bars in position. Concrete was then shoveled in, filling one-fourth of the section, which was, of course, tamped. After this the space clips were removed and a circular or band reinforce added, its position being fixed by slot punches; the space clip was again adjusted, and so the process went on. One end of the pipe was reduced in thickness, forming an outside groove when the pipes were laid. The longitudinal flat steel bars project through the concrete at both ends of the pipe with hooked ends.



REINFORCED CONCRETE PIPE AT TOLEDO, O.

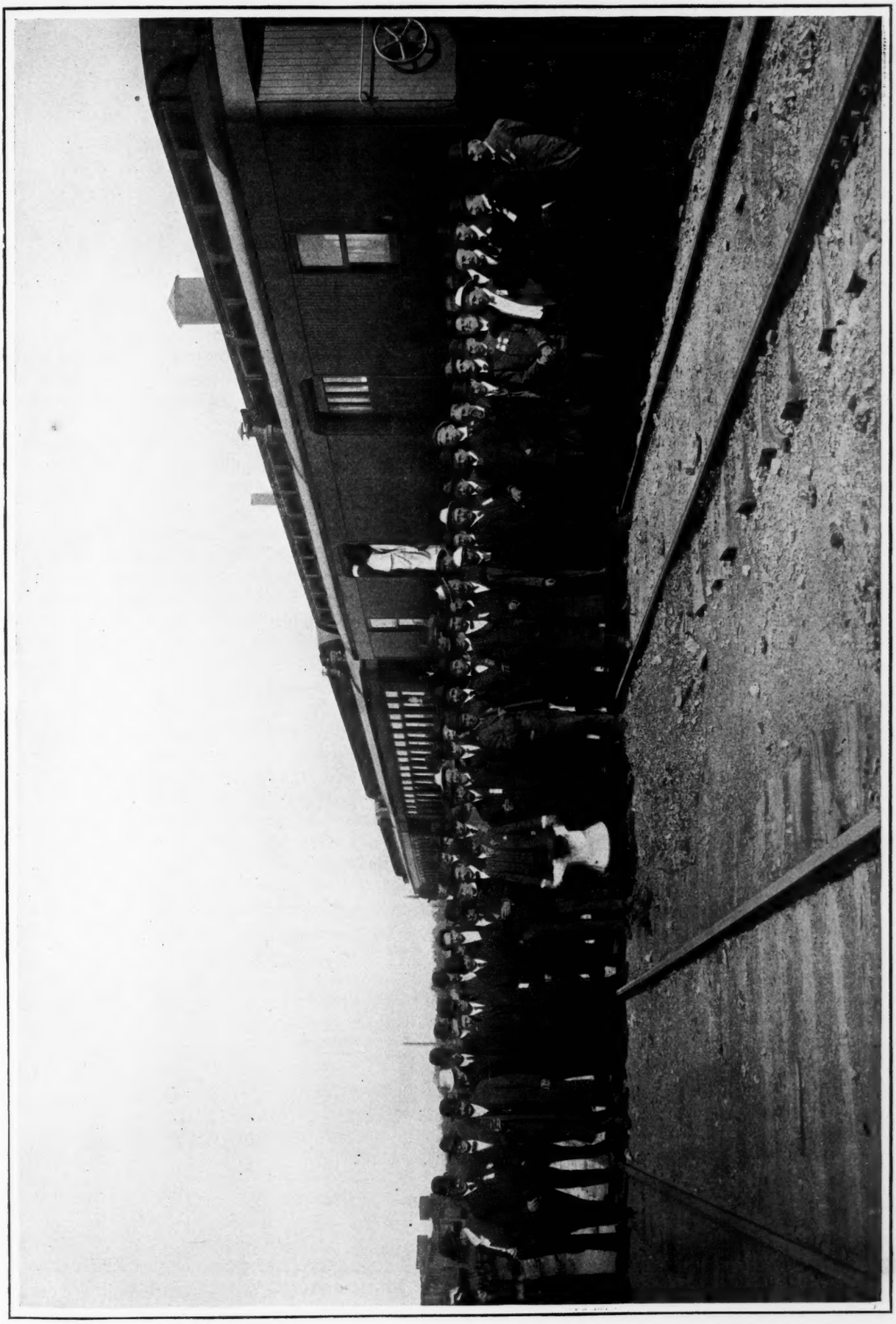
The ditch was excavated with a steam shovel, after which the pipes were lowered, one at a time. When in position the hooks of each pipe section overlapped, and a metal hoop was put around each joint, engaging the hooks of the two pipes. Wedges were then forced into the hooks to tighten the joint and concrete was packed into the groove formed by the pipes, covering the metal and making the sewer of uniform thickness throughout. It was found that the laying force could be worked very close to the excavating gang; in fact, at times the distance between the finished pipe and the steam shovel was no more than twenty feet. It was found also that this form of construction allowed the backfilling to follow the laying very closely, even the last section laid being covered with dirt. This is possible because the sections are already set when lowered, and the interlocking of the steel bands at the joint is sufficiently rigid to take the strain. The work of laying these pipes proceeded at the rate of about one hundred and twenty feet per day

Fire Ordinance Concerning Basements

INDIANAPOLIS, Ind., has just passed a fire ordinance making it unlawful to construct a basement, cellar or sub-cellar which is to be used for storing goods or for manufacturing without providing as part of the construction "lines of iron water pipes of not less than two and one-half inches in diameter for an area surface space of four thousand square feet or less, and with an increase of one-half inch in diameter size of pipe for every one thousand additional square feet of basement, cellar or sub-cellar area surface." These lines are to be provided with automatic rotary nozzles with adjustable tips, one for every 400 square feet of area. A Siamese connection, placed on the outside of the building, must be attached to the main feed line, each nozzle to have a separate check valve, be threaded with the Indianapolis standard thread, and have a cap with spanner lugs chained to the nozzles. Basements already constructed may be required to install such pipes, etc., after ninety days notice, if used for storage or manufacturing, as may also all theaters, hotels and public assembly halls. Fine, $10 to $100, each day constituting a separate offense.

Photograph of Municipal Officials

ON the opposite page is presented a photograph of the members of the American Society of Municipal Improvements, who were present at the Birmingham, Ala., convention, taken during their trip around the "Horn." Among these, passing from right to left in the front line, may be recognized the then President, C. C. Brown; the present President, Morris Sherrerd; Secretary George W. Tillson, City Engineer Julian Kendrick, First Vice-President James Owen, Past President Charles H. Rust; and in the center, Past President A. Prescott Folwell, while scattered throughout the group are other officials, among them Fred Giddings, W. F. Reichardt, and T. Chalkley Hatton. Altogether about fifty-five appear in the group.



DELEGATES AT THE BIRMINGHAM CONVENTION OF THE AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS

CONCRETE FILTER MASONRY

Structural Details of Large Plant at National Capital as Given by Allen Hazen—Settlement of Masonry Work—Other Features

THE latest large sand filtration plant to be completed in this country is that at Washington, D. C., and the structural details of this, therefore, presumably embody the latest results of the experience of the designer, Mr. Allen Hazen. This description, with the illustrations, formed part of a paper presented by him before the American Society of Civil Engineers, to which we are indebted for the same:

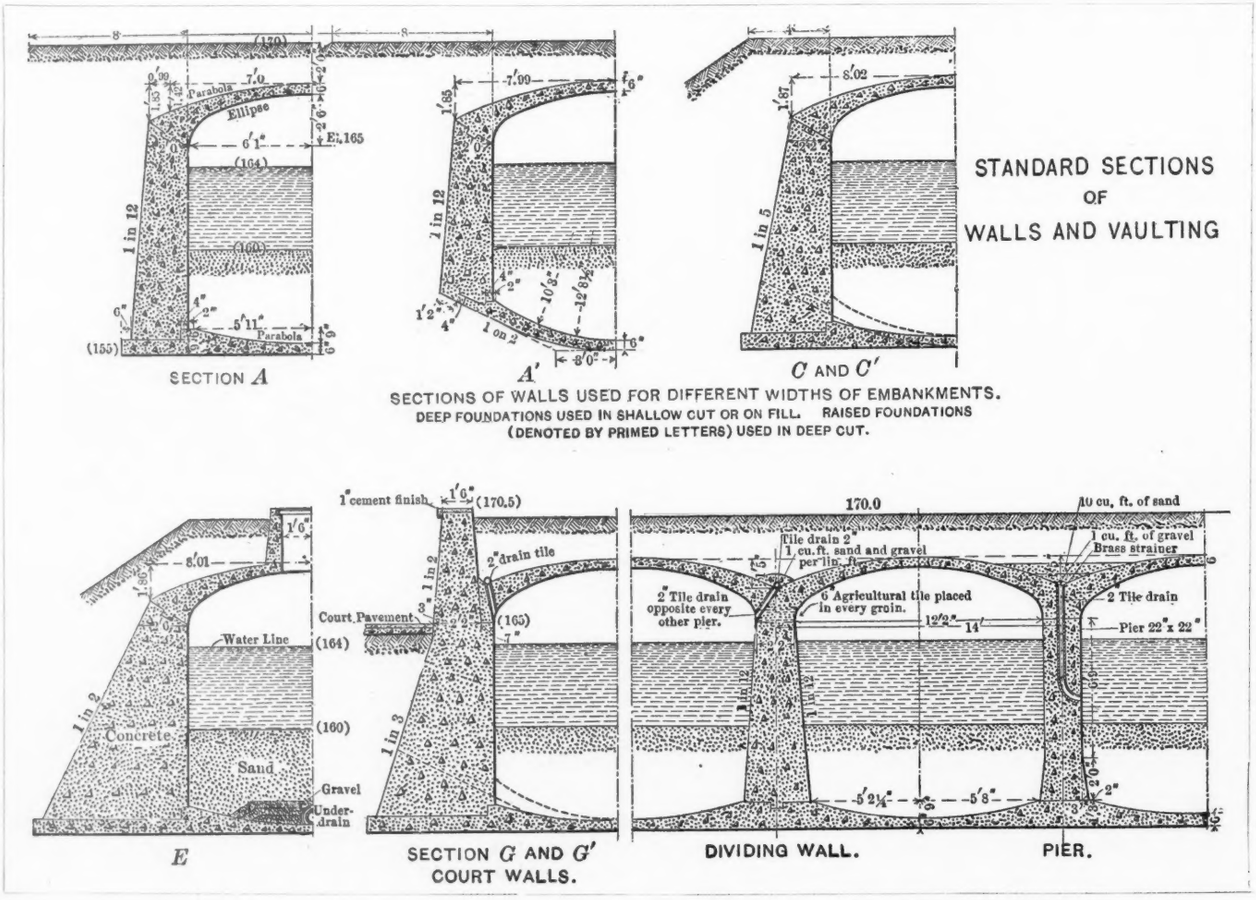
"The floors are of inverted, groined arches, carrying piers with a slight batter near the bottom. The walls are of concrete, built in sections not exceeding 30 feet long, the joints being tongued and grooved. The roof is elliptical, groined arches, much like those at Albany, but with a deeper cut over the piers, so that the average thickness of the roof is only 0.61 feet, a saving of 14 per cent. as compared with Albany. The tongued and grooved joints in the walls were made by fastening a plank to the forms for the ends of the wall blocks first built. This formed a groove. The tongue was formed when the second block was built. Generally, the tongues had a slight batter and were at least three times as wide as long, to prevent them from breaking off when movements occurred.

"Parapet walls were built over the outside walls along the courts, in order to save space. Generally, it is better to cover all the masonry with embankments, but in this case the site was so limited in area that the space which could be saved had a value more than equal to the concrete in the parapet walls, and in the extra thickness of the walls below, which was necessary in connection with it."

Most walls in similar constructions act as beams, supported at the floor and roof, and with the earth pressure as a load, the earth also taking the thrust of the vaulting and contained sand and water. But in section G little if any of the vaulting thrust would be taken by the earth directly, and in section E the embankment could not be made sufficiently thick to take the pressures safely, and the wall was made sufficiently strong to stand alone.

SETTLEMENT OF MASONRY STRUCTURES

"An interesting feature of the masonry work was caused by the settlement of parts of the work. The highest part of the site was 65 feet vertically above the lowest part. This was all graded to allow the filters to be at the same level. The maximum depth of cut was 35 feet, and the maximum height of fill 30 feet. Approximately, five acres of masonry structures were built upon fill. The filling was made with material obtained in the excavation, which was generally gravel mixed with clay. The material was excellent, and it would have been difficult to secure anything better for the purpose. It was placed in thin layers, and rolled thoroughly with heavy, grooved, steam rollers. Embankment built in this way was harder, as tested by the distance that an iron bar would penetrate, than the

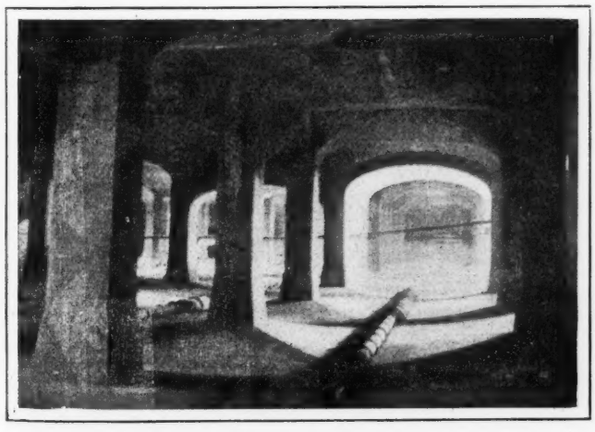


natural undisturbed surface, and refilled with embankments made as above described, before the masonry was placed, but in some cases it was difficult to tell just where the old surface had been. In other places, where it had been under heavy loading in deep fill, it seemed to be as solid and as little likely to settle as the original material, and such places were left intentionally, as it was believed that they were sufficiently solid to carry the loads to be placed upon them.

"It is difficult, or rather impossible, to determine from the old records just how much of this old filling was left in place. It is known that there was considerable of it, and the greatest settlement seems to have occurred over those places where it was deepest. In some places the filters were built one or two inches higher than the intended grade, so as to approximate more nearly the desired conditions after settlement. The settlement of the masonry does not in any way affect the stability or usefulness of the plant. The greatest practical inconvenience comes from the differences in level of the filters resulting from it.

"At several places the shape of the site was such that it was necessary to place the outside walls on lines not parallel with the pier lines. The plan adopted was to place the outside wall on a diagonal line and to carry a cylindrical arch of the usual shape springing from it for a distance not exceeding one-half the usual span of the arch. The piers were built on the usual plan, as near the wall as possible, and the groined arch vaulting was carried up from them. The customary curves were used in all cases, and the various surfaces intersected formed irregular arches which tended to be narrow and pointed like Norman arches. This became well developed at places where the piers were near the walls. The angles of the outside walls were arranged so that the relations of the piers to the walls became the same at regular intervals, and this allowed the special centering to be used over again. In some cases there were small triangular places at the tops between the different surfaces, which were not large enough to warrant the construction of another pier. These were built perfectly flat, a small quantity of steel being used in the concrete.

"The piers are all at 14-foot centers, except that the span was made four inches shorter for five of the filters, in order to fit the dimensions of that part of the site with a fairly regular design."



INTERIOR VIEW OF FILTER

Cost of the Work

There were twenty-nine filters, and these involved 862,700 cubic yards of excavation, costing 30 cents a yard; 299,500 cubic yards of filling at 30 cents; 36,563 cubic yards of concrete in the floors at $6.75 a cubic yard; 19,038 cubic yards in the walls at $7.35; 6,964 cubic yards in the piers at $8.25 a yard, and 34,920 cubic yards in the vaulting at $8.75 a yard; these totaling $1,098,400. The drains cost $35,200; the 36,500 cubic yards of filter gravel, at $2.75 per yard, cost $100,400; the 157,725 cubic yards of filter sand at $2.65 per yard cost $418,000; a total of $553,600. The sand-washing pipes, apparatus, and bins cost $89,600. The office, laboratory, and equipment cost $19,700. The court, lighting, gates, meters, and other miscellaneous structures and appliances cost $435,700, making a total cost of the filters of $2,197,000.

DETROIT HOME TELEPHONE COMPANY

Description of Their New Underground System—Construction of the Ducts—The Lateral Distribution—Other Equipment

By H. H. MACK

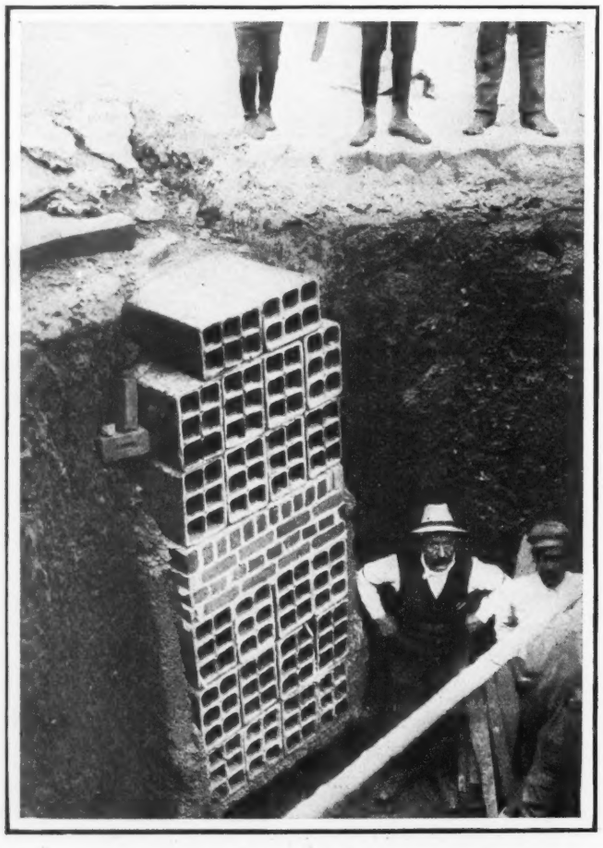
The Home Telephone Company, which by purchase succeeded to the franchise and physical property of the Co-Operative Telephone Company, is at present installing a plant in Detroit, Mich., which will cost more than $5,000,000. The actual work of constructing the plant is under the direct supervision of W. B. Woodbury, General Manager, and W. C. Pole, Engineer of the Home Telephone Company. The original design for the plant was made by Charles H. Ledlie, of St. Louis, Mo., who is represented in Detroit by Joseph Lillich. The general plan for the equipment provides for one large central building and four sub-stations, to be located in the outskirts of the city. Cables will be laid underground, connecting all of the sub-stations with the central station, and from these trunk lines connection to buildings will be made by direct laterals or by block alley aerial distribution. As far as is practicable, the central part of the city will be given service through an underground system. This plan is adopted in the belief that the lessened cost of maintenance will more than pay the interest on the additional cost of the initial installation.

The Underground System

This will contain three million duct feet of conduit and 1,250 manholes, which are estimated to cost more than $750,000, and in laying which a force of 1,200 men is being utilized. Vitrified conduit, manufactured by H. B. Camp & Co., is being used. The sections are each three feet long, and the number of ducts varies with the needs of the lines, one, two, three, four and six-multiple duct tile being used. Each duct opening is three and a quarter inches square, the inner walls are five-eighths and the outer walls three-quarters of an inch thick.

The trenches are excavated to such a depth that the top of the concrete, over the duct, is not less than twenty-four inches below the street surface, and are wide enough to provide for a three-inch concrete wall on each side of the tiling. The trenches are so graded that the duct will drain, naturally, from one manhole to another, or from the center of each section, in opposite directions, to the manholes. Concrete three inches in depth is placed in the bottom of the trench and allowed to set thoroughly before the tile is laid.

The unevenness of the cement bottom of the trench is overcome by the use of mortar composed of one part cement to six parts sand, wet to a consistency that renders it convenient to use, and spread no thicker than is necessary to produce a smooth, level surface. The joints of the abutting sections of tile are surrounded by a strip of wet burlap six inches wide, and long enough to permit of making at least two laps around the tile, extending an equal distance each side of the joint. A thin layer of cement mortar being placed over the first lap of the burlap, and the second lap being drawn tightly over it until the mortar is forced up through the meshes of the burlap. The joint is then finished by placing cement mortar over the burlap to a thickness of three-eighths of an inch. The top and sides of the tile are then covered with a layer of concrete three inches thick, and, when it has had time to harden, the work of back-filling begins, dirt being put in in four-inch layers, each of which is thoroughly tamped before another layer is added.



LARGEST MANHOLE OF THE DETROIT HOME TELEPHONE COMPANY'S SYSTEM.

Manholes, Covers and Frames

The ducts are placed at the depths which the obstructions in the street make necessary, and the bottoms of the manholes are carried sufficiently below these to afford free access to the tile. The manholes are walled with vitrified brick, on a concrete foundation six inches thick, unless the nature of the subsoil, at the bottom of the excavation, requires a thicker foundation. The walls of the manholes are thirteen inches thick, except that the deeper holes have eighteen-inch walls a part of the way up. The manhole covers and frames are made of cast-iron.

Poles and Cables

The lateral conduits terminate in iron bends, which are set at the base of each terminal pole, where they will be of easy access for the future installation of cables. Only such bends are piped up to the cable pole as may be required in each case for the original installation of cable. The trunk line cables are 19 gauge, the long-distance connections 20 gauge, and the short-distance lines 22 gauge. A system of "multiple-top" distribution will be adopted in connection with the installation of lateral cables, and very little copper wire will be used. The poles used are straight, of uniform size, and having remarkably large butts; the contract provides that they shall all be peeled while the sap is still in them.

Switchboard Equipment

The central office will be equipped with switchboards, the initial capacity of which will be 15,000 lines, but which will be so designed that the ultimate capacity may be increased to 40,000 lines. The number of sub-station telephones which will be provided for in the initial contract is 10,000. The contract for the installation of switchboards and sub-station equipment has been awarded to the Dean Electric Company, of Elyria, Ohio. The total amount of the contract let to the Dean company is $500,000.

Fire Insurance Companies Criticised

On November 26 there met in Boston, Mass., at the call of the Holyoke Business Men's Association, about one hundred delegates from various Massachusetts Merchants' Associations and Boards of Trade to protest against the actions of fire insurance companies in that State. They voted to form a permanent organization, to petition the next Legislature to provide for rate regulation by the State Insurance Commissioner, and to investigate the whole question of fire insurance and rate charges therefor. They also petitioned the New England Fire Insurance Exchange to remove the 20-cent advance in rates imposed last June. Municipal and State insurance, although urged by a few, seemed to meet with little favor. Holyoke claimed that, although it had made many improvements in the water system and Fire Department during the past ten years, the insurance rates had gone up instead of down. Lawrence claimed that after complying with a request of the companies, and spending about $50,000 on fire protection, these immediately, and in spite of this, raised the rates, instead of reducing them. Apparently no representatives of the insurance companies were invited to be present to answer the charges.

PRIMITIVE STREETS IN THE ORIENT

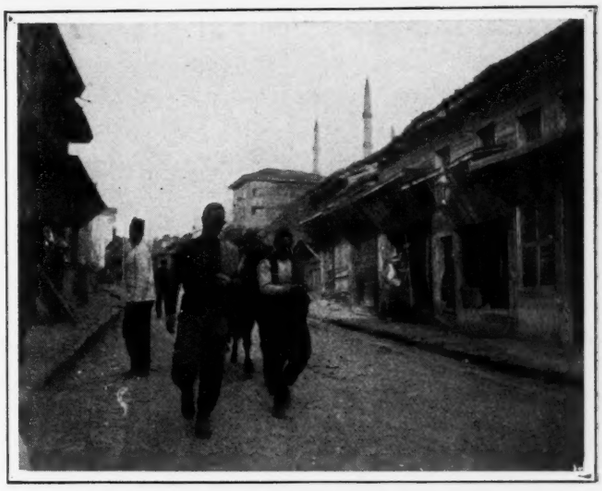
By FELIX J. KOCH

It is always interesting to go back to the original form of all our modern conveniences; and perhaps in Turkey we come as close to the original city street, still in actual use, as anywhere on the Continent. First came the houses, then the street, in Turkey. To be more correct, first came the city walls, built by those who settled on the site centuries before the Turk entered Europe. Inside this wall the people built in haphazard fashion. And the streets, when they developed beneath the feet of pedestrians,

QUAY AT SALONICA

camels, and donkeys, simply wound hither and thither, in and out. Your Turk is a middle-of-the-road citizen, and perceives little use for a sidewalk; even when such a convenience is present, and Adrianople and Salonica are practically the only cities in the Orient where sidewalks are found. Whether the narrowness of these is the cause or the result of this tendency is uncertain; but both the tendency and the narrow sidewalks are well shown by the illustrations, and may be found in any ancient street on the Continent.

STREET IN ADRIANOPLE



STREET IN ADRIANOPLE

After sidewalks, came the paved gutters, and for both of these large stones were used; and when roadways were first paved large, flat stones were used for these also, as in Pompeii. The quay at Salonica shows a transition stage between these large stones and the modern granite block or brick. Stone blocks, large and small, flat or cobble, made the roadway practicable in all seasons; modern improvements have aimed to make them comfortable to ride over, easy to clean, and noiseless.

MUNICIPAL WATER FOR PASSAIC

The Water Supply Committee of the Passaic, N. J., Common Council, at a meeting on November 26, decided to endeavor to acquire by condemnation proceedings the pipe system of the private company which is now furnishing the supply. While the legal procedure decided upon is a novel one, City Attorney Sullivan expressed himself as sanguine of a favorable outcome. This belief is based on the right of a city to condemn any property within its corporate limits. At any rate, a report will be presented to the Council, in which it will recommend that the City Attorney take immediate steps to have the mains of the Acquackanonk Water Company in the city condemned. The matter will be presented to the courts as soon as necessary steps can be taken, and Judge Pitney will be asked to appoint a commission to appraise the property. It is not expected that the water company will submit without a long legal battle.

Regarding the source of supply, two plans are being considered, one the sinking of artesian wells, the plan which is said to be immediately practicable; the other would depend upon the success of a plan outlined by Governor Stokes in his last message, namely, that the State should acquire control of water sheds at the sources of the Passaic river. This plan would involve the building of an immense storage reservoir near Mountain View or Little Falls, a few miles from Passaic. By constructing a dam a mile long at one of these places a lake can be created having an area of 30,000 acres, into which the waters of the Pequannock, the Ramapo and the Rockaway rivers would discharge 300,000,000 gallons daily.

REFUSE DISPOSAL FOR STATEN ISLAND

Investigation of the Subject Thorough—Specifications Believed To Be the First of Their Kind in the United States

For about two years the subject of refuse disposal in the Borough of Richmond, New York, has been under investigation. The work involved in determining a method of final disposal suited to the local conditions consisted in obtaining careful records of quantities, with a separation of refuse into different classes and a series of determinations of the calorific power of the combustible constituents, some of the results of which are given below. In addition, various practical tests in burning mixed refuse were conducted, and recommendation was finally made for the adoption of mixed refuse destruction following British methods.

The investigations were conducted under the direction of Mr. Louis L. Tribus, Acting Commissioner of Public Works of the Borough, by Mr. J. F. Fetherston, Acting Superintendent, who later was commissioned to examine and report on various installations in Great Britain, and who spent about six weeks during May and June of this year in inspecting thirty-nine modern British destructors. Bids are asked for a destructor, to be received December 27, the specifications for which are believed to be the first attempt in the United States to cover in a technical way the requirements necessary for success in burning mixed household refuse, combined with sufficient data concerning the material for intelligent bids.

The work is to be finished in ninety working days. No bid or estimate will be considered unless it be accompanied by at least three certificates, each signed by an engineer-in-charge of the type of refuse destructor proposed, setting forth the details of the installation under his charge and certifying that (a) the destructor is operated without nuisance; that (b) the temperature of the main flue or combustion chamber under ordinary working conditions is higher than 1,250° F.; that (c) heated air is used for combustion; that (d) at least one pound of water has been evaporated per pound of mixed refuse burned, during a period of at least eight (8) consecutive hours, and that (e) the steam power so produced is utilized for municipal purposes. Failure to comply with any or all of the requirements herein noted will be sufficient ground for the rejection of a bid or estimate.

General Information

The district to be served by the West New Brighton refuse destructor contains a population of approximately 26,000 people, contributing at present from 30 tons in summer to 50 tons in winter of mixed household refuse (ashes, garbage and rubbish) per work day. The district contains private residences, stores and tenement houses, with some manufacturing establishments.

The property owned by the city upon which the destructor will be erected is situated on the north shore of Richmond Borough (Staten Island). The land in question fronts on Richmond Terrace near the foot of Taylor street, West New Brighton, and has a width of about 100 feet and a depth of about 330 feet. The destructor will be erected as far from the roadway as possible on a salt marsh near the Kill von Kull river.

Following the general layout shown on the plan, the contractor is to provide general plans with all necessary dimensions showing the foundations with piling and footing courses for building, runway, connecting flues and chimney. Also plans with elevations for building, runway, connecting flues and chimney. It is proposed to build the destructor building, foundations, runway, connecting flues and chimney in reinforced concrete. The destructor contractor furnishes general plans upon which the city arranges for the construction of the building, foundations, runway, connecting flues and chimney at the city's own cost and expense.

In addition to these plans the contractor is to furnish complete plans, specifications, supervision, labor, materials and appurtenances necessary for the erection and completion of the destructor itself. These plans and specifications, together with all work, materials and appurtenances necessary for the erection and completion of the destructor are to cover the cells or units complete, the flues (not a part of the building), combustion chamber, regenerator or air heater, boiler, apparatus for forced draught, dust-catchers or dust-traps and such other necessary appurtenances as are required in the destruction of mixed refuse. The furnace will be erected complete with all adjuncts by and at the expense of the contractor, and the cost of this work is to be included in the contractor's bid or estimate.

Plans and Specifications

The destructor shall be capable of destroying 60 tons (2,000 pounds per ton) of mixed household refuse (ashes, garbage and rubbish) per 24 hours under normal working conditions, when the material is such as is contributed during the winter months, noted under heading "Composition of Refuse" in a succeeding paragraph. Provision for a future extension of 120 tons ultimate capacity of plant should be made.

The layout provides for tipping refuse behind closed doors into a storage hopper capable of holding 120 cubic yards (60 tons) of refuse; back hand shovel feeding of refuse from storage hopper direct to grate in cell or cells, with clinkering at the front, and provision for dropping hot clinker through the floor to a lower level, using the heat abstracted from the clinker in raising the temperature of the air required for combustion, if it is practicable to so utilize the otherwise wasted heat, or else the clinker hopper to serve as a storage and cooling chamber. The products of combustion pass on to a water tube boiler situated at a lower level than the cell or cells, from whence the gases escape to the chimney situated near the southerly line of the property. Space is left for an engine room and clinker machinery room, wherein the power may be utilized as may be deemed advisable after the available energy has been determined in actual practice. Ample room is left for the installation of a clinker utilization plant. The idea of arranging the building is to pro-

vide as much light, air and room as possible for the comfort and convenience of the firemen or stokers. A mess room under the tipping platform is also proposed, where toilet, bath and locker facilities may be provided. Space for an additional 60-ton furnace to be erected in the future has been arranged. It is of the utmost importance that the building and general layout of the plant should be made as attractive in appearance as is possible.

Ample light and air should be provided about all working spaces within the building. Particular attention should be paid to ventilation, and it is suggested (though not required) that the air for combustion be drawn through ducts from the upper portions of the cell room and upper portions of the tipping room, thus controlling the flow of dust and smoke, and causing air from outside the building to rush in, instead of allowing dust or smoke to escape to the outer air. In the proposed layout, it may be possible (though this provision is optional) to advantageously arrange a carcass chamber, whereby dead animals could be lowered through a port on the boiler room deck into a combustion chamber. A movable door or curtain should be placed over the hopper opening at the feeding level to control the dust. Ample room should be provided for the cleaning of all flues, dust settling chambers, boiler tubes, etc., so that the plant may be operated continuously six days each week, one day (Sunday) being allowed for cleaning.

The contractor shall furnish tools for firing, clinkering, barrows for clinker removal, draught gauges for recording ash pit pressures, self-recording steam gauge or gauges, high temperature indicators sufficient to last for six tests of eight hours each, a continuous CO_2 recorder of the gravimetric type, low water indicators or annunciators for boiler, thermometers for recording stack temperature, heated air and atmospheric temperatures, draught gauge for chimney, and such other appurtenances as are necessary to complete the installation, including injectors, feed water pumps, etc., for the boiler.

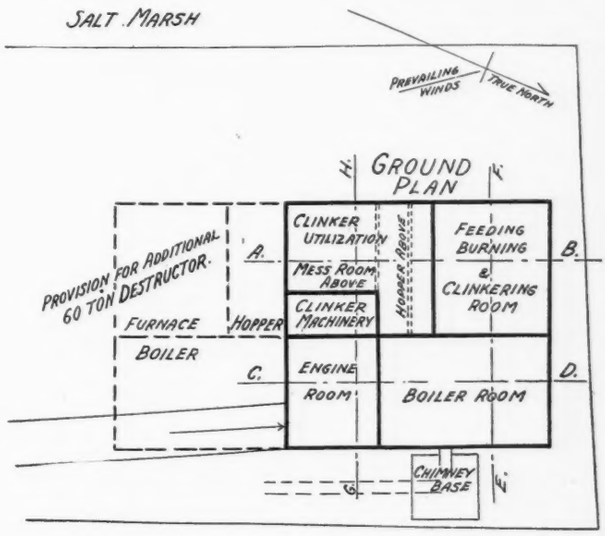
The contractor shall furnish an experienced engineer or construction foreman, who shall supervise the erection of the destructor portion, and who shall instruct the firemen in the operation of the destructor for a period of at least two weeks after the acceptance of the destructor. During the time when the brickwork of the destructor is being slowly heated and dried the contractor's engineer or foreman shall supervise the operations, but the coal and labor necessary during this period will be supplied by and at the expense of the city.

If the destructor contractor is not satisfied with the condition of the foundations of furnace, boiler, cells, etc., he should specify the defects and so notify the superintendent in writing, whereupon the sufficiency of the foundations shall be tested, and their adequacy ascertained. Starting the erection of the destructor will be considered as equivalent to approval of foundations on the part of the destructor contractor.

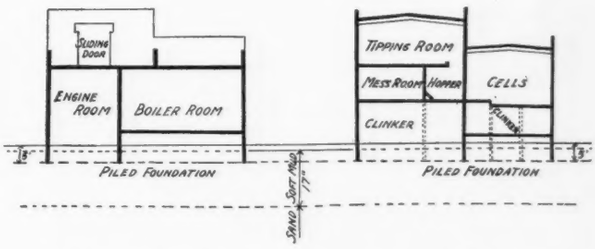
The contractor shall make good any defects due to poor materials or workmanship which may appear within twelve months after the completion of this contract, and the issuance of the final certificate by the Superintendent shall in no way exempt the contractor from the obligation of remedying and correcting defects within the twelve months aforesaid.

Guarantees

The following guarantees are required: (a) The contractor shall guarantee that the residue from the furnace under ordinary conditions of operation shall be free of organic matter, thoroughly burned, hard and vitreous; (b) that no nuisance shall be created in the ordinary operation of the plant; (c) that neither odors, obnoxious gases, nor dust shall escape from the building or chimney; (d) that at no time during the continuous operation of the plant shall the temperature of the combustion chamber or main flue fall below 1,250° F; (e) that the flues, dust chambers and boiler setting shall be so arranged that the dust may be withdrawn after one day's cooling of the fires; (f) the contractor shall guarantee and specify a minimum or a seasonal rate of evaporation ("from and at" 212° F.), and an amount of net useful



GROUND PLAN OF PROPOSED PLANT



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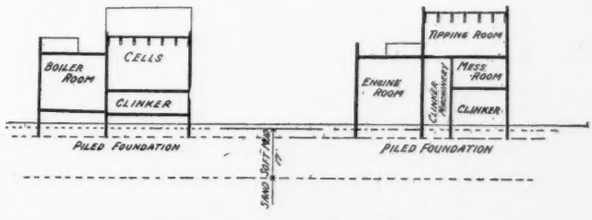

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steam per pound of refuse burned, either in pounds of steam per pound of refuse or as a percentage of efficiency of boiler and grate per pound of dry refuse, based upon the information given in the paragraph headed "Composition of Refuse;" (g) the contractor shall state the amount of material to be handled per fireman or stoker employed, per eight-hour shift when high grade labor is used; (h) the contractor shall guarantee to destroy refuse at the rate of 2.5 tons per hour when the material is such as is collected during the winter months shown by the tables in paragraph headed "Composition of Refuse." The contractor shall repeat and include the foregoing guarantees as part of his specification accompanying the bid or estimate which is sent to the President of the Borough of Richmond.

TESTS

Upon the completion of the destructor, and when it is ready for use in burning refuse, the contractor shall notify the superintendent thereof, in writing, and as soon thereafter as possible, a test run for a period of not less than two weeks under the joint supervision of the superintendent and contractor shall be made to determine the sufficiency of the contractor's guarantees. During the test run, the quality and quantity of refuse burned shall be varied to represent as closely as possible the seasonal differences in composition, volume and weight of the material, as indicated in the tables under "Composition of Refuse." If it should appear that the destructor is not meeting the requirements specified under "Guarantees," the contractor shall agree to make any changes necessary to carry out his part of the agreement. Should the contractor fail in meeting the essential requirements of the "Guarantees" concerning the creation of nuisances due to the operation of the furnace, the city may refuse to accept the destructor, in which event the contractor must remove from the city's land the destructor and its appurtenances.

The following information concerning the local cost of labor and materials is volunteered for the information of the contractor:

CLASS OF WORK	RATE PER HOUR	KIND OF MATERIAL	RATE
Labor	$0.20—$0.25	Spruce lumber. . . .per M. ft.	$36.00
Carpenter	0.40— 0.50	Yellow pine lumber—per M. ft.	40.00
Bricklayer	0.50— 0.65	Sand. . . . . per cubic yd.	2.00
Ironworker	0.40— 0.50	Portland cement. . . .per bbl.	$2.00—2.50
Painter	0.40— 0.50	Common brick. . . . . per M.	8.00—9.00
Horse and cart	0.40— 0.45	Broken stone. . . .per cubic yd.	1.75—2.00
Team	0.50— 0.65	Building lime. . . . . per bbl.	1.25

As no decision has yet been made with regard to the utilization of steam power produced from the refuse, the contractor shall arrange a suitable blow-off for escaping steam. The boiler to be installed should be of ample capacity to utilize all heat generated. The chimney will be of reinforced concrete, not less than 125 feet in height, of sufficient capacity for a plant burning 120 tons of refuse per 24 hours. The refuse to be burned in the destructor consists of ashes, garbage and rubbish. Ashes may be defined as the residue from fires in houses, schools, churches, stores, etc., and includes other inorganic materials such as glass, crockery, metallic substances, dirt, dust, earthenware, bricks, stones, etc. Anthracite coal is generally used in the West New Brighton district. Garbage consists of organic wastes such as vegetable matter and animal matter with grease, water and slop. Rubbish consists of wood, paper, rags, excelsior, straw, leather, rubber, etc.

Table No. 1 shows the quantity and seasonal variations of the different classes of materials as collected in the West New Brighton district.

As the materials noted in Table No. 1 contained admixtures of various kinds of refuse, a mechanical analysis or separation into different classes was carried out in order to determine the combustible and incombustible constituents, the results of which are summarized in Table No. 2.

The "fine ash" noted in Table No. 2 consisted of materials from the "Ashes and Rubbish" collections which passed through a 3/8-inch mesh screen. "Coal and Cinders" compose materials rejected by the screen and not otherwise classified. Clinker consisted of large lumps which could be picked out of the "Ashes and Rubbish" by hand. "Free Water" in garbage consisted of the water lost in handling the material.

TABLE No.1.—HOUSEHOLD REFUSE AS COLLECTED, WEST NEW BRIGHTON DISTRICT

MONTH	ASHES AND RUBBISH				GARBAGE				TOTAL COLLECTION		
	VOLUME	WEIGHT			VOLUME	WEIGHT			VOLUME	WEIGHT	
	Cu. Yds.	Tons	Per cent. of 12 months' collection	Per cent. of total monthly collection	Cu. Yds.	Tons	Per cent. of 12 months' collection	Per cent. of total monthly collection	Cu. Yds.	Tons	Per ct. of 12 mos.' collection
1906											
January	2014.	962.9	10.6	83.5	409	190.6	5.7	16.5	2423.	1153.5	9.3
February	1852.	871.5	9.6	87.6	265	123.5	3.7	12.4	2117.	995.0	8.0
March	2199.	1072.7	11.8	86.0	373	173.8	5.2	14.0	2572.	1246.5	10.1
April	1972.	973.8	10.7	79.3	545	254.0	7.7	20.7	2517.	1227.8	9.9
May	1857.	990.4	10.9	78.7	574	267.5	8.1	21.3	2431.	1257.9	10.2
June	1725.	734.0	8.1	71.9	617	287.5	8.7	28.1	2342.	1021.5	8.2
July	1516.	426.0	4.7	58.3	653	304.3	9.2	41.7	2169.	730.3	5.9
August	1661.	417.4	4.6	54.3	753	350.9	10.6	45.7	2414.	768.3	6.2
September	1677.	429.1	4.7	50.9	889	414.3	12.5	49.1	2566.	843.4	6.8
1905											
October	1567.	564.7	6.2	60.1	803	374.2	11.3	30.9	2370.	938.9	7.6
November	1678.	759.8	8.4	71.4	652	303.8	9.2	28.6	2330.	1063.6	8.6
December	1894.	877.5	9.7	76.6	574	267.5	8.1	23.4	2468.	1145.0	9.2
			100.				100.				100.
Totals	21612.	9079.8	.....	.....	7107.	3311.0	.....	.....	28719.	12391.7	.....
Percentage of total collection	75.2	73.3	.....	.....	24.8	26.7	.....	.....	.....	.....	.....
Quantity per 1,000 inhabitants per day	2.77	1.164	.....	.....	0.91	0.425	.....	.....	3.68	1.589	.....

Remarks—1 ton = 2,000 pounds. Daily collection of refuse, except Sundays. Average weights per cubic yard—Ashes and Rubbish = 0.42 tons. Garbage = .466.

TABLE No. 2—COMPOSITION OF HOUSEHOLD REFUSE BY WEIGHT

Month	From Table No. 1		From Mechanical Analysis							
	Ashes and Rubbish %	Garbage %	Fine Ash %	Clinker %	Glass, Metal, etc. %	Coal and Cinders %	Garbage			Rubbish %
							Vegetable %	Animal %	Free Water %	
1906										
January	83.5	16.5	40.5	1.4	3.1	34.7	14.3	0.6	0.7	4.7
February	87.6	12.4	40.3	1.3	3.4	38.3	10.9	0.4	0.3	5.1
March	86.0	14.0	42.6	1.2	3.1	35.5	12.2	0.5	0.6	4.3
April	79.3	20.7	40.8	1.0	3.2	31.5	17.9	0.8	0.8	4.0
May	78.7	21.3	37.7	0.6	5.7	31.8	18.7	0.7	0.7	4.1
June	71.9	28.1	30.7	11.1	8.4	16.2	24.4	1.0	1.4	6.8
July	58.3	41.7	23.8	0.8	9.0	12.6	36.3	1.6	1.7	14.2
August	54.3	45.7	20.0	0.5	10.9	9.0	39.7	1.7	2.0	16.2
September	50.5	49.1	21.7	0.6	8.5	7.7	42.5	1.9	2.2	14.9
1905										
October	60.1	39.9	29.0	3.5	6.6	15.2	30.9	3.1	1.5	10.2
November	71.4	28.6	31.8	0.7	5.2	30.8	22.6	1.8	1.0	6.1
December	76.6	23.4	34.4	0.9	3.1	34.6	19.6	1.1	0.8	5.5
Averages	73.3	26.7	34.7	1.8	4.8	26.7	22.6	1.2	1.1	7.1

Samples of the different classes of materials mechanically separated, as shown in Table No. 2, were tested in a calorimeter at the Lederle laboratories, coal and cinders giving an average of 4,901 B.T.U., 1.64 per cent. water, 54.06 per cent. ash, and 44.29 per cent. combustible, and a calorific power of the combustible of 11,066 B.T.U. Garbage gave an average of 8,243 B.T.U., 1.52 per cent. water, 17.93 per cent. ash, 80.55 per cent. combustible, and a calorific power of combustible of 10,233. Rubbish gave an average of 8,437 B.T.U., 1.83 per cent. water, 12.85 per cent. ash, 85.32 per cent. combustible, and a calorific power of combustible of 9,889. The fine ash contained 16.14 per cent. combustible, and the clinker 9.33 per cent.

As the calorific tests were made on materials containing very little moisture, and as garbage consists mainly of water, a series of evaporative tests were carried out to determine the amount of water per pound of garbage, which was found, in thirty-nine tests, to average 71.4 per cent., ranging from 61.4 per cent. to 79.4 per cent.

POLICE ORGANIZATIONS

Their Origin and Administrative Features — The French Gendarmerie and Other Systems—United States Secret Service—Duties

By LEONHARD FELIX FULD, M.A., LL.B.

In most of the countries of the world the government is strongly centralized. Historically, the monarch was the government, and every local officer his servant. Although in many countries constitutional limitations upon the power of the executive have made the monarch merely the chief administrative officer, or even less, yet these constitutional provisions have in the older countries of the world not done much in the way of changing the monarch's position towards the localities. Bearing this in mind, we are not surprised in finding in most European and South American countries, as well as in most of the colonies of European nations, a strong national police system. Where almost every important governmental activity is attended to by agents of the central government, the police function, which is in many respects the most important of all, is naturally controlled by the central authorities. Moreover, the central control of the police was either formerly necessary, or in some cases is necessary even to-day to protect the continued existence of the State against local uprisings. The police force of the central government may either be the sole police force of the country, or it may be supplemented by the work of municipal police officers. The French gendarmerie is a police force of the latter kind, and since all the countries of Europe which have a national police have copied the more important administrative features of the French system, we shall briefly consider the organization and duties of this body of policemen.

The first organized police force in the world, and the direct ancestor of the gendarmerie, was the maréchaussée established in France in 1356 to take cognizance of crimes committed by deserters from the army. Later its jurisdiction was enlarged to include all crimes committed on the highways, and, after being reorganized in 1720, it became the famous gendarmerie of France. This body of police is under the control of the French Minister of the Interior, and is practically a military force discharging police functions. In Germany, Italy and most of the other European countries which have a national police force, the force is also under the control of the Minister of the Interior. The gendarmes have duties to perform for which they are held accountable by the Minister of War, the Minister of the Interior, the Minister of Justice, the Minister of the Navy, the Minister for the Colonies, and the local authorities. The principal duties of the gendarmerie are to maintain order on the public highways and give prompt notice to the central authorities of any serious crimes or accidents coming to their notice, and to arrest deserters from the army and enforce the provisions of the law relating to compulsory military service. The Minister of the Interior issues to the gendarmerie the orders which relate purely to the police functions of the force, such as the patrol of rural highways and the maintenance of police lines at pageants in the cities. From the Minister of the Navy the gendarmerie receives instructions relative to the arrest of naval deserters; from the Minister for the Colonies relative to banished convicts, and from the Minister of Justice relative to the maintenance of order in the courts, the apprehension of accused persons, the

summoning of jurors and the execution of the mandates of the court. The local authorities are forbidden to call upon the gendarmerie for assistance, except in cases of extreme emergency, and while the gendarmerie is technically under the command of the general of the army in charge of the prefective, yet the gendarmerie is not considered a part of the military garrison, and cannot, except in time of war, be employed to discharge functions which are not police functions.

In the United States

The national government in the United States has only such powers as are granted to it by the Constitution. According to a well-established principle of constitutional interpretation, all powers not expressly granted to the national government are reserved to the commonwealths and denied to the national government. Therefore, since the general police power has not been granted to the national government, no centralized national police force can be established in the United States such as exists in European countries. But a number of powers have been granted to the national government which require incidental police work, and to perform this national police work specialized national police bureaus have been created. The Constitution gives to Congress the power to coin money, to establish post-offices and to regulate commerce with foreign countries. In exercising these powers the United States Government must detect and punish counterfeiters, post-office robbers and violators of the immigration laws, and for this purpose we have three national police forces—the Secret Service, the Post-Office Inspectors and the Immigration Inspectors.

The Secret Service of the United States is a division of the office of the Secretary of the Treasury. Originally established during the Civil War as a division of the War Department for the purpose of securing military information from the enemy and preventing the counterfeiting of United States coin by the enemy, it was later discontinued, and in its stead a sum of money was appropriated by Congress to be expended by the Secretary of the Treasury in paying rewards to local police officers for the arrest and conviction of counterfeiters. Finally, the Secret Service was reestablished as a division of the office of the Secretary of the Treasury, charged by law with the prevention and detection of the counterfeiting of United States bonds and currency. In addition to its duties with regard to counterfeiting, the Secret Service is also the general detective force of the United States Government. Whenever a detective is required to discover evidence tending to prove criminal irregularities on the part of a government officer, or a conspiracy by private citizens to defraud the government; whenever the President of the United States requires special protection while traveling, or the War Department in time of war needs a skilled detective to gather some important military information, a requisition is made upon the Secretary of the Treasury for the detail of a Secret Service operative, and the pay of such an operative is then charged to the executive department to which he is detailed. There is no special statutory provision regarding the performance of detective work by the Secret Service men for the other governmental departments. Such details are necessary, however, since the United States statutes expressly prohibit the United States from engaging private detectives, and are permissible since the President, under his general executive power, has authority to transfer and dismiss officers of the United States at his pleasure. The Immigration Inspectors are officers of the Bureau of Immigration of the Department of Commerce and Labor, whose duty it is to detect and prevent violations of the immigration laws. Much of their time is spent in pursuing, arresting and returning Chinamen illegally resident in this country. The Post-Office Inspectors are attached to the office of the Postmaster-General. They have two functions—an administrative function and a police function. As administrative officers, it is their duty to inspect the post-offices of the country periodically, make recommendations tending to increase their efficiency and report irregularities and infractions of the postal regulations. As police officers, it is their duty to detect and arrest criminals of all kinds, both federal officials and private citizens, who injure the postal service by their crimes. All of these national police officers generally do their own detective work, and then, when the criminal has been detected, call for the co-operation of the local police to take him into custody.

The English System

The English police system combines in a peculiarly happy manner administrative efficiency with local independence. Everywhere in Great Britain, with the exception of London, the policemen are appointed by the watch committee of the City Council, are removable by the same local authority, and are supported by the municipality. In this way is secured that local self-government which is so dear to the heart of the Englishman, and so, too, is removed that dread of a centrally-appointed police force, which an Englishman scents from afar as tyrannical and oppressive. But the police function is properly a State function, in which the State has a vital interest, and municipal police administration may or may not be efficient. To obviate this difficulty the police force of every city and town is regularly inspected by officers of the Home Office, a bureau of the central government. If the local force is found sufficient in numbers, well organized and disciplined, and in other respects up to the standard set by the central authorities, the general government will pay half of the cost of maintaining the force. This system of granting aid after inspection is a very powerful stimulus for administrative efficiency without in any manner interfering with local self-government, because, if the city prefers to be free from governmental inspection, it is at perfect liberty to manage its police force as it pleases, losing as a penalty for its obstinacy, however, the grant of State aid.

Dwellers in the city complain if a policeman does not appear on the scene within sixty seconds of the occurrence of a disturbance; country folk are surprised to see a police officer at any time. The rural police in the United States consists of one or more constables in each town, while the sheriff and his deputies also have certain

police duties to perform in the county. The police force is inefficient in time of quiet and grossly inadequate and incompetent when a serious tumult occurs. No systematic patrol of streets or highways is maintained. Criminals are safe in the country, and country crimes often go unpunished. That they are not of more frequent occurrence is due to the ordinary criminal's mental uncertainty as to country topography, his superstitious dread of heavily-shaded grounds, his unfamiliarity with rural household arrangements, and his dread of dogs and of the rural man-servant, who, as well as his master, is usually handy with firearms. Added to this is the comparative worthlessness of the booty he is likely to get. He knows, however, that he has nothing to fear from the police. Yet police protection is needed as much in rural districts as in urban districts. Owing to the sparser population, the number of crimes in the country, it is true, is smaller than in the cities, but the crimes which are committed in the country are frequently more revolting and atrocious than those of the city. Attacks upon women are more frequent and more serious in rural districts. In times of serious tumults the deficiency of our system of rural police protection is even more marked. It is the duty of the sheriff to preserve the peace in the county. When rioting occurs, as it now so frequently does in connection with labor troubles, the sheriff swears in an extra lot of men as deputies, and with an unorganized body of followers goes forward to meet the enemy. An attempt is thus made to overcome a body of rioters, many of whom are desperate, with an undisciplined body of men. There is probably no civilized country in the world which has such a grossly inadequate rural police protection as the United States. and the result of this condition of affairs is that the cumbersome and expensive military must be called out after serious damage has been done to person and property in cases where an efficient police force could have quickly restored order with a minimum of loss.

Police and Municipality

Police officers in the United States, though recognized by the courts as officers of the commonwealth, are considered by the people as well as in the practical administration of politics and government as municipal officers. Police appointed by and under the control of the central authorities are looked upon by the liberty-loving American as a tyrannical agency. The American municipal police is furthermore fairly efficient in maintaining order in the city. No English-speaking people has ever had a state constabulary—a police force appointed and controlled by the central authorities and operating as the sole police force throughout the entire State—and the establishment of such a State constabulary can be justified only on the ground that American cities have shown an utter incapacity for self-government in the department of police administration. The term metropolitan police is employed in the United States to designate a police force established by the authorities of the State government, not for the entire State, but only for one city; in other words, it is a State police for a city. Generally, the metropolitan force is governed by a commissioner or a board, appointed either by the Governor of the State or by the State legislature. The idea of a central control of metropolitan police was imported from England, where a Metropolitan Police District was established for London in 1829, both for the purpose of securing unity of police administration throughout a thickly-settled district, which it was not deemed expedient to consolidate for all purposes, as well as for the purpose of supplying an efficient administration, where local administration had proved inefficient. The system of a metropolitan police force has been copied at one time or another in a number of American States. The more important motives which have led to the establishment of these metropolitan police forces were either a desire to secure a more effective enforcement of the excise laws or a desire to gain a partisan advantage.

Civil Service Regulations for Firemen

We give below the Civil Service regulations which recently went into force in Massachusetts, applicable to all cities, except Boston. The Commonwealth gives much attention to its Fire and Police Departments, and its example might well be followed by other States and municipalities. The regulations follow:

The examination of applicants for positions as call firemen in cities other than Boston shall include: 1. A pass test in reading and writing, being merely copying in writing a few lines of printed matter. 2. Experience sheet. 3. A physical examination and a strength test. Equal weight to be given to subjects 2 and 3.

The examination of applicants for positions as permanent firemen shall include four subjects, as follows:

1. Accuracy and government paper—with weight of	2
2. Experience paper—with weight of	4
3. Knowledge of duties and local data—with weight of	4
	10
4. Physical examination and a strength test—with a weight of	15
Total	25

Subject 1 shall include one paper divided into the following topics: (a) Accuracy test (consisting of copying in writing a few lines of printed matter, and of writing orders from dictation); (b) Simple questions in government.

Subject 2 shall include: Paper containing detailed questions as to applicant's experience and record, both as fireman and otherwise. (If he desires to apply as a driver, questions as to his knowledge of horses, care of horses and driving; if he desires to apply as an engineer, questions as to his knowledge of and experience with steam engines, or the presentation of State license).

Subject 3 shall include: Practical questions relating to the duties of firemen, local data, etc.

Large Municipal Lighting Plant

A power plant is being installed at Lockport, Ill., at the lower end of the sanitary canal which leads from Chicago into the Ohio River, from which power will be transmitted eighteen miles to Chicago to be utilized for lighting streets and public buildings. The plant contains four 4,000-kilowatt alternators, which makes it one of the largest municipal lighting plants in the country. These alternators are furnished by the Crocker-Wheeler Company, of Ampere, N. J.

STREET CLEANING IN WASHINGTON

DURING the year ending June 30, 1906, Washington, D. C., removed from its streets and alleys about 139,000 cubic yards of débris, the details of which work are given in a report just issued by John T. Twohey, Superintendent of Street Cleaning. The salaries of the department amounted to $46,838, paid to forty-eight employees besides the superintendent. About 62 per cent. of the area of paved streets cleaned was by hand patrol work, the rest by machine sweeping. The cost of the former was 17.8 per 1,000 square yards cleaned, the contract price for the latter was 16 13-16 cents for the same area. The cost per cubic yard of débris removed was $2.09 by hand patrol and $0.83 by machine. The hand patrol, however, collected and removed in addition paper and similar matter which amounted to 10,458 bags full in ten weeks, or at the rate of nearly 80,000 bags a year; and it is estimated that this service occupied fully one-fourth of their time. Hand sweeping removed one cubic yard of dirt for each 11,729 square yards, or each cleaning removed a mean depth of .003 inches; while machine sweeping removed a mean depth of .0073 inches. The cost by hand patrol this year was 0.82 cent less than last year. The lowest bid received in April of this year for a three-year contract for machine sweeping was 22¾ cents, which was accepted.

For cleaning alleys the price was 35 cents per 1,000 square yards, which was increased to 40 cents by the contract let in April. The cost per cubic yard of débris, however, was but 96 cents, or 13 cents more than for that from streets.

The above costs of hand sweeping do not include the cost of inspectors, or general supervision of any kind, which would add approximately 15 per cent. to the above, or make hand sweeping cost 20.5 cents per square yard, or $2.40 per cubic yard; the former 22 per cent. more than machine sweeping, the latter nearly three times as great. If we diminish the cost of hand sweeping by 25 per cent. to allow for collecting paper, its cost was 8 per cent. less per square yard than machine sweeping, and 2 1-6 times as much per cubic yard.

Somerville, Mass., Waterworks

THE waterworks of Somerville, Mass., have been classed as very satisfactory, from a fire-protection point of view, by the National Board of Fire Underwriters. The supply, from the Metropolitan system, is ample and reliable; the consumption (89 gallons per capita) is not considered excessive, and is being reduced by the installation of meters. The pressure on the high service ranged from 53 to 95 pounds, with an average of 75; and on the low from 35 to 65 pounds, with an average of 56.6. Of all the mains 43.4 per cent. are six inches and 4.6 per cent. are four inches in diameter, but these are fairly well gridironed, and are in good condition and unobstructed. The gate valves are so spaced that the average length of mains which would be affected by a single break is 690 feet in a mercantile district and 820 feet in a residence; which the Board recommends be reduced to minimums of 500 and 800 feet. The fire hydrants are spaced an average distance of 260 feet apart in the mercantile section and 310 in the residence, the Board recommending 250 and 350 feet respectively as minimums. It is recommended in addition that all hydrants have at least one 4½-inch steamer outlet, and not less than a 6-inch barrel and connection pipe; and that the threads be the national standard. Also that the minimum sizes of hydrant-feeding mains be 6-inch for outlying residence districts, 8-inch for closely-built residence, and 12-inch for manufacturing and mercantile. Somerville is a residence suburb of Boston, with a population of approximately 71,000.

Municipal Revenue from Garbage

SOMERVILLE, MASS., in 1900 made a five-year contract by which she received $1,100 a year for her garbage. Not satisfied with this, the Mayor, on the termination of this contract, recommended selling directly to customers, and the necessary buildings were constructed on the city's land adjacent to the Health Department stables, where the sale of garbage brought in $4,549.86 in the first nine months, the added expense of handling and hauling due to this change having been $470. The supply has not equaled the demand, which has been from raisers of swine.

Economy in Concrete Construction

So important a part does concrete now play in construction work, that considerations of economy in handling it have become of the first importance. For mixing, manual labor is still cheapest, where the quantity is small, but details of mixing platform, of handling and measuring could be improved upon in many cases. It is doubtful, however, if improved methods of mixing, whether by hand or machinery, could effect a saving of more than 25 cents per cubic yard over the best ordinary present practice.

It is hardly probable that there will be much future reduction in the price of material used in concrete, which now costs about one-half as much as that in brick masonry. Cement prices will be reduced in certain localities by the erection of local plants; but sand, stone and gravel will probably rise rather than fall in price.

In certain classes of work, however, there would seem to be a considerable saving possible by the invention and use of improved forms—even $2 or $3 per square yard in some cases. In the Attleboro standpipe, described in another part of this number, the comparatively simple forms cost $2.65 per cubic yard of concrete. Hill, in his "Reinforced Concrete," gives $5 to $7 per cubic yard as a rough estimate of the cost of forms for a reinforced concrete factory. We call the attention of ingenious engineers to this promising field for invention. Forms for sewers, manholes, catch-basins and similar structures are of especial interest to city engineers.

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NEW YORK, DECEMBER 5, 1906.

CONTENTS

Concrete in Municipal Work

MUNICIPAL work in small cities and towns is generally of a temporary character, as was much of that in the larger cities up to a few years ago. But as a city grows in size and approximates a permanency of conditions in the business sections, and as the use of public utilities in the larger cities increases in intensity, a more permanent and enduring form of construction becomes desirable than would be economical in a small municipality. In fact, the very excellence of a too substantial construction might be used as an argument against replacing it with an improved form of structure.

In increasing the permanency of almost every class of municipal work concrete takes a prominent place, and no municipal engineer should fail to appreciate the possibilities of this material, or to understand the facts and theories involved. Street railway tracks are now commonly bedded in concrete stringers or on concrete ties. Sewers are made of concrete, either monolithic or in sections; manholes and catchbasins are constructed in place in forms, which may be collapsible; flushtanks of reinforced concrete which has been given a waterproof wash on the inside offer several advantages over brick. Electric cable conduits are bedded in concrete in practically all cases; and the manholes of these, of steam-heating lines, and for access to large water-main valves are very often of the same material. In the larger cities subways and practically all underground structures are built of concrete. This material is also used for lining and roofing reservoirs; for building septic tanks, filters, and standpipes, as described elsewhere in tnis number; and for foundations to pumps, chimneys, and all large or heavy structures.

Probably the greatest amount, however, is that used in street paving. Roadway paving, other than macadam, is generally used uneconomically if placed on a foundation less solid than concrete; and this has been reinforced in at least two cases, as stated in another column. And the amount of concrete used for sidewalk paving has grown to immense figures. Probably 5,000,000 or more cubic yards of concrete have been used for sidewalks and paving foundations during the past year. Its use in the form of blocks or artificial stone does not demand so much of the engineer's attention, although voussoir stones for sewers have been used by some cities, and facing stones for bridges and retaining walls may well be of this character.

The great advantage of concrete is its relative cheapness as compared with brick or stone masonry; one of the chief elements in which is the possibility of using low-priced labor. But in this is an element of danger also, for such labor is generally ignorant and often careless, and requires most careful oversight. For carelessness in mixing, in placing, or in removing forms may easily wipe out a factor of safety theoretically ample.

Bridges and culverts claim less attention from the City Engineer than most of the other constructions mentioned, but the use of concrete, generally reinforced for the former, is becoming quite common for these also. Taken all in all, there is probably no other one material which it is more important for the municipal engineer to thoroughly understand, and we feel more than justified in devoting considerable of our space this week to calling attention to this fact.

STANDARD AND UNIFORM REPORTS

From Municipally Operated Utilities—Private Operation Also—Suggested Form for Schedule—Arrangement of Items—Application to Massachusetts Plants—Other Interesting Features.

By HARVEY S. CHASE, Boston, Mass.
President of the Incorporated Public Accountants of Massachusetts.

THERE are probably few, if any, who have given the matter serious consideration who are not in favor of standard and uniform reports concerning public utilities and municipal enterprises, but the preparation and adoption of such standards offer some difficulties. For the latter the authorities must be invoked through State laws; as in the case of the gas and electric companies in Massachusetts and New York, and of municipal accounts in Ohio, Wyoming, New York, and Massachusetts. For the preparation of such standards the United States Census Bureau is working, and its indorsement will go far toward insuring their adoption.

DIFFICULTIES TO BE OVERCOME

The fundamental authorities being thus in evidence and in activity, we may properly devote our attention to the difficulties. What are these difficulties? In an endeavor to get at some of these things at first hand, and to make them clear to himself and to others in a practical way, the writer has taken the best material available, namely, the annual returns by gas and electric companies and by municipal industries in Massachusetts, and has attempted to set up their financial transactions upon a standard schedule.

For this schedule a form submitted at the recent conference called by the Census at Washington in February has been taken. This form had subsequently been discussed and amended by a special committee of the American Association of Public Accountants appointed for this purpose by the President of the Association. The deliberations of this committee are not yet completed, and it was for the purpose of furnishing material for additional discussions in that committee, as well as of preparing this article, that the examination of these Massachusetts returns was undertaken.

In order that there may be no misunderstanding, I will state plainly that the forms here set forth have not been finally accepted by any individual or committee. They are tentative forms devised for the purpose in hand, and subject to modification hereafter. With this explanation the schedule may now be presented, mainly as a basis for further discussion.

REVENUE AND EXPENSE FORM

We will first consider the proper form for "Revenue and Expense" transactions of a public utility during the fiscal year, including in this item all revenues *accrued* during the year and all expenses *incurred* during the year. The fundamental items of such a statement are three: First, the revenue; second, all expense which must be paid ultimately out of revenue; third, the excess (or deficiency) of revenue for the year and the disposition of it. My experience advises me to reverse this arrangement in part, and to set forth "Expense" first, followed by "Revenue," and then by the disposition of the excess or deficiency.

SUGGESTED FORM OF STANDARD SCHEDULE

For Financial Statements of Municipal Enterprises and Public Service Corporations—
Revenue and Expense During the Year.

EXPENSE OF OPERATING

1. Expense of manufacture		$
Operation	$	
Maintenance		
Product purchased		
2. Expense of distribution		
Operation	$	
Maintenance	$	
3. General expense (salaries, office supplies and expenses)		
Total (1, 2 and 3)		$
4. Taxes (real estate and other)		
5. Franchise taxes (paid or accrued annually or otherwise)		
6. Rentals (leaseholds, etc.)		
7. Insurance (fire, accident and fiduciary)		
8. Damages (including extraordinary legal and other expenses and losses)		
9. Guaranty (bad debts written off and reserve for doubtful accounts)		
10. Depreciation (deterioration written off and reserve for estimated depreciation)		
Total expense of operating		$.

REVENUE FROM OPERATING

Gross earnings from public services	$	
Gross earnings from private consumers		
Gross earnings from by-products, etc.		
Total	$	
Deduct rebates, refunds, discounts, etc.		
Total revenue from operating		
a. Net revenue from operating (or deficiency)		
b. Other revenue, or income, net (from sources other than operating)		
c. Appropriations for operating, provided by the municipality from general funds		
Total available income		$.

DISPOSITION OF AVAILABLE INCOME

11. Interest on funded and floating debts		$.
Remainder of available income		
12. Reserved for sinking funds	$	
13. Reserved for amortization funds		
14. Reserved for other funds		
Total reserves	$	
15. Dividends (private plants)		
16. Appropriation to general city funds (public plants)		
Total disposition of available income	$	
Credit (or debit) balance transferable to "surplus"		$

The expenses of operating are set forth under ten headings. The first three are common both to publicly-operated and to privately-operated plants, and are ordinarily set forth in the accounts of most plants. Items 4 to 10 are separately stated, but are also important elements of expense, and all of them must ultimately be provided for out of the revenues of the plant. If these elements of expense are not properly provided for in this manner in the accounts, there will come, sooner or later, a time when the enterprise, if privately operated, will fail and require reorganization and new capital. If publicly operated, the drain upon the tax levy will become overwhelming and the public operation will be denounced and abandoned.

All of these ten items are true "Expenses of Operating." In addition, there are other requirements which must also be provided for, such as interest payments and provisions for sinking funds (11, 12, 13 and 14). In private plants these items must be paid out of revenue, they cannot be provided for from capital. Similarly, these items in a municipal plant must be provided from revenue; either from revenue of plant, or from appropriations of general tax levy. Appropriations for these purposes are legitimate and proper, as they have to do only with the manner in which the municipality provided the original cost (capital) of the plant.

Elements of Expense

In the schedule we therefore handle these items as "Dispositions of Net Revenue," and not as elements of "Expense of Operating." Expense is set forth first, followed by revenue, for the reason made clear in subsequent tables, that in a large number of municipal plants no earnings are set forth in the accounts covering street lighting, which is the main business of these plants. Sometimes a definite appropriation is made for this purpose, but even in such cases it is generally insufficient to cover the expenses of the service. Therefore, one cannot, at present, satisfactorily compare revenues of private plants with revenues of municipal plants. Expenses, however, must always include the same classes of items and can be properly compared. Expenses are therefore set forth first. Revenue follows; and the difference between its total and the total expense of operating discloses the net revenue (or deficiency) from operating (*a*). To this must be added (*b*) revenue or income (net) from sources other than operating, and for public plants (*c*) municipal appropriations for operating provided from tax levy or other general city funds, but not including any appropriation used for new construction, improvements to the plant, or other capital purposes. The total of these three items (*a*, *b* and *c*) gives the available net income from which to deduct the additional requirements for interest, sinking funds, etc., described above.

It is desirable to bring to the reader's attention a number of other important points.

First—It is evident that revenue from sales of product —water, gas, electricity, power, etc.—should be separated from revenue from extraneous sources, such as from rents, or from investments and securities, etc. In the schedule these extraneous sources of revenue are set forth at "*b*," as explained above, and do not affect the financial results of the business viewed solely as a gas undertaking, an electric undertaking, etc.

Second—It is evident that discounts, rebates, refunds, etc., should be handled as deductions from revenue, not added to expense, thus giving true "earnings," actual revenue.

Third—There are three primary divisions of expense, as previously mentioned.

1—"Expense for Manufacture," pertaining to gas, electricity or power for street railways, this subdivision for water being called "Expense for Water Supply and Storage."

2—"Expense for Distribution," which explains itself. Each of these two divisions is subdivided into 'Operation" and "Maintenance." "Operation" covers strictly running expenses and "Maintenance" covers repairs and deterioration. These subdivisions are essential for this reason: That as this schedule is to apply both to public plants and to private plants, the relative cost of "Operation," *i.e.* actual running expense, should be evident, and, likewise, the relative amounts expended, or laid aside for repairs, including deterioration, should be in evidence. Comparing a public enterprise with a private enterprise, the operation expense of the first plant may be heavier than the corresponding expense of the second plant, while the maintenance (repairs) expense of the first may be much less than that of the second. Important differences in administration would thus be shown by our schedule, whereas if these items appeared only as a total in each plant, these totals might be approximately the same, and conclusions drawn therefrom might then be exceedingly misleading.

3—The third division of expense is "General Expense," a designation which we all understand. The important point here is that "General Expense" shall not include any of the items which are sure to differ very materially between public plants and private plants *per se*. That is to say, taxes and franchise payments are distinctively *private* plant charges, sinking fund provisions are commonly only *public* plant charges. Insurance differs very greatly. Interest varies markedly. Damages and extraordinary legal expenses apply differently. Depreciation is usually inadequately handled, etc., etc., therefore we do not include any of these variables in "General Expense." They follow later in the schedule. The items which should be included in "General Expense" are these: Salaries of officers, general salaries, directors' allowances, rent of offices, general office expenses, postage, telegraph, telephone, stationery and printing, ordinary legal expense, etc.

Fourth—The total of the three primary divisions of "Expense" is then given. Comparisons of the costs of public and private administration up to this point may be safely made, as all the preceding elements should be identical in character.

Fifth—All additional items which are necessary elements of expense before "net revenue" can be established may be considered somewhat as variables. These represent actual facts even though they may be omitted in the bookkeeping. Taxes are paid by private plants, but usu-

ally lost to the public treasury through public plants. They must be properly considered for correct comparisons. Insurance, in its various phases, is a risk which must be taken and estimated, or paid for.

Damages and legal expenses (extraordinary) differ greatly between public and private plants, and are therefore set up separately here.

Guaranty for losses on bad debts or other shrinkages of current assets is also variably handled.

Depreciation of machinery and plant is complicated and difficult to allow for, and yet it goes on daily and hourly in every plant. It must be provided for either consciously in the books or unconsciously in undistributed reserves, or else the plant will suffer and the capital value will be reduced.

All these items are true charges against revenue before profits, or net revenue, can be established.

Returns Upon Capital

Owing to the different methods of providing capital for public plants and for private plants, the returns upon (or repayments of) this capital must be carefully considered in the reports and disclosed in the schedules. Public capital is usually borrowed on bonds or notes and paid off through sinking funds. Payments into sinking funds for such a purpose are therefore distributions of net revenue just as much as dividends upon share capital in private plants are distributions of profits. Interest also is a payment for use of capital—borrowed capital to be sure, but still capital. Payments of interest are therefore actually distributions of net revenue paid upon borrowed capital in place of dividends paid upon share capital.

In order to correctly compare distributions of profits in private plants with net revenues in public plants, we must consider the total of dividends, interest, and sums laid aside for franchise amortization in the former, against the total of interest, sinking fund items and returns to the general municipal treasury similarly laid aside in the latter.

The next division of the schedule, "Disposition of Net Revenue," is, therefore, of fundamental importance. All the items included thereunder have no relation to "Expense of Operating." They are merely distributions of net revenue. That this is true of dividends is universally accepted. That it is true of moneys laid aside for sinking funds is also evident after a moment's thought. To consider interest in the same category is perhaps difficult for the average fiscal officer, but it is apparent that this item represents the use of capital, in this case borrowed money.

It would be impossible to compare net revenues of public and private plants if interest were put above the line while dividends were left below the line. Take, for instance, a private corporation with $500,000 share capital and no bonds, and a municipal industry with $500,000 4 per cent. bonds outstanding. If interest were put above the line the public plant would be charged $20,000 as an expense item, whereas the private plant would have no such charge above the line. This distinction is essential and must be carefully observed for all comparative purposes.

Object of Consolidated Schedule

The remainder of the schedule explains itself, and I need say only that each of the items given in this consolidated statement should be set forth in details on subsidiary supporting schedules which should follow, in the main, the uniform distribution of the accounts provided in the standard schedules of the American Water Works Association, the American Gas Light Association, the National Electric Light Association, and the Association of Street Railway Accountants. It will be found feasible and practicable to draw off the items needed for the consolidated statement, herewith submitted, direct from the standard detailed schedules of these four national associations. The original schedule was presented by the writer at the second conference upon Uniform Municipal Reports, etc., called by the United States Census at Washington, D. C., in February, 1906. It was slightly amended at the conference, and further amended by the Committee of Seven, in which form it was presented as a "Progress Report" to the American Association of Public Accountants in October; final action being delayed until after the report of the National Civic Federation's Committee is published. The United States Census and the Investigating Committee of Twenty-One of the National Civic Federation have practically approved these forms as the basis of the financial reports which will be made hereafter by that committee upon public and private enterprises in this country and abroad.

Schedules thus standardized and accepted will thereupon become the foundation upon which the accumulation of data can safely be made for years to come. Results predicated upon such data can then be accepted and acted upon intelligently in the light of local conditions, in any community which may consider the purchase or establishment of municipal enterprises of this nature.

Already the purpose of the standard schedule has appealed to a wide constituency in this country and in Great Britain, and it may be safely stated that the effect of a full discussion of the fundamental accounting propositions concerned in it cannot be other than exceedingly beneficial to officers of both public and private plants, to public accountants, to business men, and to intelligent citizens generally.

The writer has no bias for or against municipal ownership, but as a professional accountant he appreciates fully that financial results are by no means the only ones which must be carefully considered when comparisons are made between public and private operation. Other matters are frequently of equal or greater importance. Financial results, however, are of serious importance, and they cannot be too fully and accurately stated. Municipal officers and citizens should be enlightened by the accounts and reports from their plants, not blinded and misled by them, as is frequently the case at present.

The United States Census is about to undertake a complete inquiry into municipal operation of public utilities throughout the country, and great care will be given to the preparation of standard schedules, both summary and detailed, for all classes of these enterprises.

REPORTS FROM TEN MASSACHUSETTS MUNICIPAL ELECTRIC AND GAS-ELECTRIC PLANTS, ARRANGED UPON STANDARD SCHEDULES

For the purpose of showing the discrepancies and gaps in the present forms of statement. Covering the year ending June 30th, 1905.

MUNICIPALITIES	HOLYOKE [Gas and Electric]		WESTFIELD [Gas and Electric]		WAKEFIELD [Gas and Electric]		MIDDLEBORO [Gas and Electric]		TAUNTON [Electric]		CHICOPEE [Electric]		DANVERS [Electric]		BRAINTREE [Electric]		CONCORD [Electric]		HULL [Electric]	
Population	45,700		12,300		9,200		6,900		31,000		19,000		8,500		6,000		5,600		1,700	
Expense of Operating																				
1. Expense of Manufacture Operation	105,914.74		23,397.63		18,103.25		7,684.52		26,645.81		15,134.05		8,897.20		10,232.93		9,023.27		7,330.05	
Maintenance	14,427.86	120,342.60	1,858.01	25,255.64	1,314.50	19,417.75	458.59	8,143.11	1,636.37	28,282.18	1,335.92	16,469.97	731.47	9,628.67	1,179.39	11,412.32	598.12	9,621.39	3,396.05	10,726.10
2. Expense of Distribution Operation	10,471.77		1,146.34		4,486.82		1,578.75		6,171.17		5,416.31		1,355.22		1,056.02		842.90		1,310.63	
Maintenance	9,006.41	19,478.18	953.33	2,099.67	1,413.71	5,900.53	994.53	2,573.28	5,035.97	11,207.14	1,365.50	6,781.81	1,440.93	2,796.15	1,181.06	2,237.08	858.48	1,701.38	3,933.39	5,244.02
3. General Expense		13,493.35		2,643.87		4,794.92		1,740.56		2,278.06		1,306.00		1,827.77		817.33		2,116.85		2,579.64
		153,314.13		29,999.18		30,113.20		12,456.95		41,767.38		24,558.38		14,252.59		14,466.73		13,439.62		18,549.76
4. Taxes																				
5. Franchises																				25.00
6. Leaseholds, rentals, etc																				
7. Insurance		1,190.32		528.49		513.12		211.43		552.25				720.55		407.49		237.49		1,173.23
8. Damages																				
9. Guaranty		676.55		147.73		56.69		216.41				83.95		9.60						200.90
10. Depreciation		47,042.29		7,445.88		6,793.13		3,746.06		13,819.16		5,804.59		2,013.32		4,094.93		4,735.07		5,193.37
Total Expense of Operating		202,223.29		38,121.28		37,476.14		16,630.85		56,138.79		30,446.92		16,996.06		18,969.15		18,412.18		25,142.26
Revenue from Operating																				
Earnings from public services	54,264.72				1,469.18		743.09		1,845.04		16,899.94		347.82		270.29		523.88			
" " private consumers	183,417.89		38,197.62		26,256.36		11,581.27		40,594.79		14,401.19		12,854.06		13,750.69		11,911.59		17,319.72	
" " by-products, etc	10,306.05		4,364.46		5,581.33		395.30				1,185.24		4.50		532.50		1,995.03		1,580.90	
Total	247,988.66		42,562.08		33,306.87		12,719.66		42,439.83		32,486.37		13,206.38		14,553.48		14,430.50		18,900.62	
Deduct, rebates, refunds, disc'ts, etc.†																				
Actual Earnings from Operating		247,988.66		42,562.08		33,306.87		12,719.66		42,439.83		32,486.37		13,206.38		14,553.48		14,430.50		18,900.62
a. Net Revenue from Operating		45,765.37		4,440.80		*4,169.27		*3,911.19		*13,698.96		2,039.45		*3,789.68		*4,415.67		*3,981.68		*6,241.64
b. Other Revenue or Income from sources other than operating		1,133.82								1,463.29				246.37		27.02		185.05		1,130.27
c. Appropriations for operating provided by the municipality from general funds		247,818.75		11,500.00		40,594.73		3,411.34		17,422.50		35,149.41		8,060.00		9,282.50		8,875.62		7,600.00
Total Available Income		294,717.94		15,940.80		36,425.46		* 499.85		5,186.83		37,188.86		4,516.69		4,893.85		5,078.99		2,488.63
Additional requirements which should be provided from Available Income.																				
(Disposition of Available Income)																				
11. Int. on funded and floating debts		28,413.67		3,488.33		6,457.00		2,981.34		11,922.50		3,555.41		1,536.07		1,820.83		3,653.33		4,652.29
Remainder of Available Income		266,304.27		12,452.47		29,968.46		*3,481.19		*6,735.67		33,633.45		2,980.62		3,073.02		1,425.66		*2,163.66
12. Reserved for Sinking Funds	‡44,600.00		‡4,000.00		‡6,300.00		‡2,000.00		1,200.00		‡4,000.00		1,000.00		430.00		1,920.00		3,770.00	
13. " " Amortization F'ds.																				
14. " " Other Funds																				
Total Reserves	44,600.00		4,000.00		6,300.00		2,000.00		1,200.00		4,000.00		1,000.00		430.00		1,920.00		3,770.00	
15. Dividends																				
16. Appropriation to general city funds (public plants)	290,856.71		2,433.11		37,268.39						34,722.59				6,146.50					
Total disposition of available net income		335,456.71		6,433.11		43,568.39		2,000.00		1,200.00		38,722.59		1,000.00		6,576.50		1,920.00		3,770.00
Credit (or debit) balance transferable to "surplus"		*69,152.44		6,019.36		*13,599.93		*5,481.19		*7,935.67		*5,089.14		1,980.62		*3,503.48		*494.34		*5,933.66

*Debit balance. †Discounts deducted previously. ‡Serial bonds paid.

REPORTS FROM TEN ELECTRIC AND GAS-ELECTRIC COMPANIES IN MASSACHUSETTS, ARRANGED UPON STANDARD SCHEDULES

For the purpose of showing the discrepancies and gaps in the present forms of statement, covering the year ending June 30th, 1905.

COMPANIES	LYNN [Gas and Electric]		NEWTON [Gas and Electric]		HAVERHILL [Acc'ts of Gas Co. & El'c Co. comb'd]		CLINTON [Gas and Electric]		NORTHAMPTON [Electric]		LEOMINSTER [Electric]		GARDNER [Electric]		ORANGE [Electric]		COHASSET [Electric]		LEE [Electric]	
Population	79,300		50,200		39,500		13,700		18,600		13,700		10,800		5,500		5,200		4,600	
Expense of Operating																				
1. Expense of Manufacture																				
Operation	185,212.43		82,926.50		108,169.68		18,558.82		15,109.67		16,208.26		10,756.05		1,687.25		5,173.88		5,513.96	
Maintenance	30,117.87		13,729.02		8,822.63		3,124.84		1,21701		785.97		2,472.22		932.43		242.53		395.58	
Gas purchased		215,330.30	36,331.50	132,987.02		116,992.31		21,683.66		16,326.68		16,994.23		13,228.47		2,619.68		5,416.41		5,909.54
2. Expense of Distribution																				
Operation	33,845.57		20,983.54		14,411.32		2,730.61		5,908.54		2,133.26		1,711.63		1,561.64		1,266.73		279.91	
Maintenance	73,826.31		52,341.00		12,812.52		2,349.44		331.55		4,713.13		1,717.93		424.72		1,122.81		60.63	
		107,679.88		73,324.54		27,223.84		5,080.05		6,240.09		6,846.39		3,429.56		1,986.36		2,389.54		340.54
3. General Expense		25,317.47		17,207.77		27,825.49		6,927.75		2,911.66		2,077.76		1,177.59		1,883.62		1,074.06		967.48
		348,327.65		223,519.33		172,041.64		33,691.46		25,478.43		25,918.38		17,835.62		6,489.66		8,880.01		7,217.56
4. Taxes		22,691.83		11,581.82		10,933.15		1,344.24		2,077.40		1,256.99		981.61		502.82		184.47		373.49
5. Franchises																				
6. Leaseholds, rentals, etc																				
7. Insurance		5,933.74		3,797.78		707.16		1,120.57		626.99		852.00		777.22		330.16		464.41		181.13
8. Damages		740.95		250.00		37.65														
9. Guaranty		1,785.50				1,346.03		488.79				3,140.61		96.91						
10. Depreciation						11,010.28		2,040.82						4,137.78		6,000.00		1,500.00		526.48
Total Expense of Operating		379,479.67		239,148.93		196,075.91		38,685.88		28,182.82		31,167.98		23,829.14		13,322.64		11,208.89		8,298.66
Revenue from Operating																				
Earnings from public services	70,634.28		61,771.78		23,617.34		14,305.17		11,040.18		9,869.54		4,313.75		4,033.83		5,700.00		2,579.50	
" " private consumers	516,456.49		221,057.50		235,611.26		32,888.08		41,398.49		32,031.07		18,046.60		8,745.28		8,232.57		9,303.77	
" " by-product, etc	49,048.18		27,609.00		2,675.54		2,381.09		524,03				53.08		113,15					
Total	636,138.95		310,438.28		261,904.14		49,574.34		52,962.70		41,900.61		22,413.43		12,892.26		13,932.57		11,883.27	
Deduct, rebates, refunds, disc'ts, etc.†																				
Actual Earnings from Operating		636,138.95		310,438.28		261,904.14		49,574.34		52,962.70		41,900.61		22,413.43		12,892.26		13,932.57		11,883.27
a. Net Rev. from Op. (or Deficiency)		256,659.28		71,289.35		65,828.23		10,888.46		24,779.88		10,732.63		*1,415.71		*430.38		2,903.68		3,584.61
b. Other Revenue or Income from sources other than operating		109,991.03		5,315.77		2,807.83				434.20				200.35		212.04				13.25
c. Appropriation for operating provided by the municipality from general funds																				
Total Available Income		366,650.31		76,605.12		68,636.06		10,888.46		25,214.08		10,732.63		*1,215.36		*218.34		2,903.68		3,597.86
Additional requirements which should be provided from Available Income. (Disposition of Available Income)																				
1. Int. on funded and floating debts		4,298.76		13,260.22		6,233.56		5,447.50		90.67		3,957.70		835.81		2,519.00		970.96		1,506.55
Remainder of Available Income		362,351.55		63,344.90		62,402.50		5,440.96		25,123.41		6,774.93		*2,051.17		*2,737.34		1,932.72		2,091.31
12. Reserved for Sinking Funds																				
13. " " Amortization F'ds.																				
14. " " Other Funds																				
Total Reserves																				
15. Dividends	57,500.00		24,000.00		16,432.20		5,065.00		9,392.00				3,000.00		1,800.00				1,500.00	
16. Appropriation to general city funds (public plants)																				
Total disposition of available income		57,500.00		24,000.00		16,432.20		5,065.00		9,392.00				3,000.00		1,800.00				1,500.00
Credit (or debit) balance transferable to "surplus"		304,851.55		39,344.90		45,970.30		375.96		15,731.41		6,774.93		*5,051.17		*4,537.34		1,932.72		591.31

* Debit balance. † Discounts deducted previously.

Application of the Standard Schedule to Ten Companies and Ten Municipal Plants in Massachusetts

The plants selected were taken somewhat at random out of the total number of such plants making annual returns to the Gas and Electric Light Commissioners of Massachusetts, attention having been given to their relative sizes, gauged by their outputs and by the population of the districts served by the plants. Four of each ten are "gas-electric" plants, including Haverhill, in which the results of two separate plants are combined. The remaining twelve plants are electric solely. The figures given are those furnished to the Gas Commissioners under oath by the officers of the plants, and are authoritative. The interesting and important features of these tables are, first, the gaps in the schedules where no figures appear, and, second, the comparisons of the various elements of the expenses and of the revenues.

It must be remembered that the present comparisons are by no means final; in fact, they are merely starting points from which, after much more data in relation to any two of the plants has been gathered, it may be possible to set up truly comparative figures and to reach conclusions which will be accurate and fair. In other words, the figures given here are merely first steps in the stairway leading up to the broad platform upon which impartial comparisons of such data must be ultimately based.

With these considerations in mind, we may, without being misled, give consideration to the discrepancies and deficiencies shown in the schedules of ten companies and ten municipalities in Massachusetts.

I will call your attention especially to item 4, taxes; item 5, franchise taxes; and item 10, depreciation. Loss of taxes is evidently considered as no element of cost in any of the municipal plants, yet, of course, the lack of receipts from taxes is a distinct loss to each municipality when comparisons are made with privately managed plants. Depreciation, on the contrary, is made a distinct charge in all the municipal plants, although not allowed for in many of the companies. This will be surprising to the ordinary observer, but it arises from a requirement of law in Massachusetts whereby municipal plants must set aside, annually, at least 5 per cent. of the cost of the plant, as a provision against depreciation. Municipal plants are usually called upon to provide for sinking funds out of net revenues of the plant, or out of municipal appropriations, and these items are set forth in their proper place in the schedule.

The feature already mentioned, namely, the lack of definite payments for street lighting by the municipality to its plant, is also apparent when we follow across the first item under "Revenue from Operating."

Many other interesting features will be discovered in the schedules, if attention is given to them.

The author of this paper and the committees now discussing the matter will be pleased to give careful consideration to comments and suggestions looking toward the bettering of the arrangement or terminology of these schedules.

Tar Sidewalks in New England

Quite a number of cities in New England are using tar concrete as a sidewalk material, not always with perfect satisfaction. Mr. H. E. Blake, City Engineer of North Adams, Mass., in his annual report says: "Of tar sidewalk there have been laid 4,660 square yards during the season, and all but 233 yards of this amount is in the nature of repair or rebuilt work. . . A little consideration of the figures given . . is well calculated to set one thinking; when we realize that practically the whole expenditure for walks has been devoted to repairs and renewals of tar concrete walks we begin to appreciate the serious burdens which that class of walks imposes upon us. We now have many thousands of yards of this walk, which is constantly going to pieces and causing burdensome expenditures for repairs and renewals. . . . I would suggest that for the present, at least, we discontinue building and renewing tar walks, and turn our attention to cement or granolithic walks. At present prices cement curb and walk can be built for about the same cost as granite curb and tar walk."

Corduroy Roads of Canada

The old-fashioned corduroy road has become almost extinct in this country, but in our northern neighbor, and notably in the province of Ontario, there are some magnificent stretches of corduroy roads, which interest both for their good construction and the artistic situations into which they lead. There is one stretch of road, leading inland from Lake Joseph, built nine or ten years ago, which is particularly pretty, although the logs, lying side by side, with the sub-soil gradually rising between, makes walking rather jolty. The road stretches through the wilderness, and is edged with fern and wild raspberries. Now and then a mossy log from the forest protrudes just far enough to afford the pedestrian a resting-place; otherwise dense forest is everywhere to the crest of the hills, and the timothy meadows beyond, where there are located small farms of the peasantry.

A TYPICAL CORDUROY ROAD

THE DISPOSAL OF MUNICIPAL WASTE

Systems and Methods, with Special Reference to American Conditions—Reports on Wright, Dixon and Meldrum Destructors—Other Operating Crematories

By W. F. MORSE, Sanitary Engineer

This Series of articles, begun in the February number, will be continued until completed and will be illustrated by original drawings, cuts, diagrams and pictures, and contain many tables valuable for reference.

The Subjects Already Treated by the Author Are:—

1. The Waste Collection Service in American Towns; Methods and Results.
2. Definition of Terms; Quantities; Proportions; Character of Waste in General.
3. Garbage; Analysis; Proportions; Values.
4. Dry Refuse and Rubbish; Quantities and Treatment.
5. Classification:—Commercial Values after Recovery.
6. The Refuse Utilization Stations in New York, Boston, Buffalo, and Brooklyn (illustrated).
7. Municipal Ashes; Analysis; Proportions; Values when Separated.
8. Ashes from Cremation of Garbage; Analysis and Values; Comparative Table.
9. Comparison of Ashes from English and American Cities; Cremation Means.
10. The Utilization of Municipal Waste in General; English and American Methods.
11. Commercial Values of Refuse and Ashes when Marketed and Manufactured.
12. The Analysis of Garbage; Tankage, Its Value (Special Tables).
13. The Garbage Disposal Plant, Cleveland, Ohio.
14. Street Sweepings; Fertilizing Value and Treatment.
15. Comparative Commercial Values of Waste.
16. Foreign Destructors; Special Chapter by an Eminent Authority.
17. The First Garbage Crematorys.
18. Official Reports on Crematorys.

The Following Are to Appear:—

19. Chronological List of American Crematories from 1885.
20. Types of Furnaces; Their Employment; Municipal, Institutional, Industrial, Medical, Laboratory (fully illustrated).
21. Calorific Value of Waste as Fuel (comparative table).
22. Reduction and Extraction Process Described and Illustrated; the Earlier and Later Methods.
23. American Methods; Col. Waring and His Successors.
24. Present Situation in This Country; Résumé.
25. Means for Improvement as Suggested by Several Investigators.
26. What May Be Expected of the Future.

REPORT ON THE WRIGHT GARBAGE INCINERATING FURNACE, CHICAGO, 1906

IN 1899 Mr. W. B. Wright built for the city of Chicago, Ill., at the "Bridewell" or group of city institutions, a crematory following closely the British cell construction with additions and changes of the inventor.

The waste from the institutions, and also from an adjoining section of the city, was for five years disposed of in a satisfactory way. From an incomplete report made to the City Council in 1905 by Mr. John J. Sloan, Superintendent of the institutions, the following facts are gathered:

Number of cells		1	
Area of grades, sq. ft.		50	
Quantity burned daily	30 to	35	tons
Burned per hour, per cell	2,000 to	2,500	pounds
Burned per sq. ft. grate, per hr.	40 to	50	"
Cost of operating, per ton		30	cents
Rated capacity steam boiler		100	H. P.
Power developed (net)	55 to	60	"
Value of horsepower per ton garbage		.75	cents
Evaporation at 212°, per lb. waste		1	lb. water
Temperature of gases		1500°	

The waste comprised garbage and refuse from wards of institutions and commission houses, and included about 25 per cent. of ashes.

THE DIXON CREMATORY AT THE LOUISIANA PURCHASE EXPOSITION, ST. LOUIS, 1904

The Dixon Garbage Crematory Company, of Toledo, Ohio, was the contractor for the erection and operation of the cremators that destroyed the waste at the World's Fair, St. Louis, Mo., in 1904. Their first installation was one furnace, of thirty tons capacity, in April, but this was found to be insufficient, and a second, of the same dimensions, was added in August. Both continued in service to the close of the fair in November.

FIG. 32.—DIXON CREMATORY, LEXINGTON, KY.

From the official reports made to the Directors of the Exposition, the following details of the work are gathered:

TOTAL AMOUNT DESTROYED

Garbage, 55,361 cans, equivalent to	5,536.1	tons
Night soil, 259 cans, equivalent to	25.9	"
Light refuse, 1,133 loads, equivalent to	1,133	"
Carcasses, 34, equivalent to	17	"
Total quantities	6,712	tons

TOTAL EXPENSE OF OPERATION

Hours of labor required	6,177.	
Coal consumed	404.8	tons
Coke consumed	72.2	"
Hours of labor per ton of garbage	.92	
Pounds of coal per ton of garbage	120.5	
Pounds of coke per ton of garbage	23.	

OPERATING EXPENSE PER TON OF WASTE

Labor, .92 hours at 25c	$ .23
Coal at $2 per ton	.12
Coke at $5.50 per ton	.06.3
Total cost per ton	$0.41.3

The work done by the Dixon crematories was entirely satisfactory, and was recognized by the award of the *Grand Prize*, the highest that it was in the power of the Exposition to bestow.

Unfortunately no cuts or illustrations of the buildings or crematories are obtainable.

Disposal of Waste by Natural Gas

In some sections, and with some types of cremating furnaces, the use of natural gas as fuel is found to be both sanitary and economical, as shown by the following report:

Official Report of Dixon Garbage Crematory

Shreveport, La.—Eight Days' Trial, July 11-18, 1906

Collection

Cart Loads. Est. 1 cub. yd.		Weight per Load	Total Weigh lbs.	Tons
Garbage	16¼	1040 lbs.	16900	8.45
Mixed Refuse	21	500 "	10500	5.25
Dry Rubbish	2¼	370 "	832	.41
	39½	1910 lbs.	28232	14.11

Average weight per yard for whole collection 715 lbs.

Disposal

Fuel, Natural Gas	Labor
6 A.M. to 12 M., 19,600 cu. ft.	2 men 9 hours each
12 M. to 6 P.M., 19,000 " "	At $1.50 per day

Expenses

Fuel and Labor		Average per Ton
38,600 ft. gas at 10c.	$3.86	Average cost per ton not including capital charges or depreciation 48⅔c.
18 hours labor at 16⅔c.	3.00	
Total operating exp.	$6.86	

Signed, Simon Cohn, Supt.

The garbage separately collected contained moisture estimated at 70 per cent. The mixed refuse comprised garbage and refuse and a small proportion of ashes collected together. This report shows the relative approximate quantities of garbage and refuse in towns where natural gas is largely the household fuel.

Meldrum Destructor, Westmount, Canada

Among the latest installations of municipal garbage furnaces is the destructor at Westmount, Canada, one of the suburbs of the city of Montreal.

In May of this year there was completed for the municipality a Meldrum Simplex Destructor of three grates, or continuous cells, having the capacity of 50 tons daily; with a steam boiler for the utilization of the power developed by the combustion of the mixed refuse to be employed in the Electric Lighting Station, adjoining.

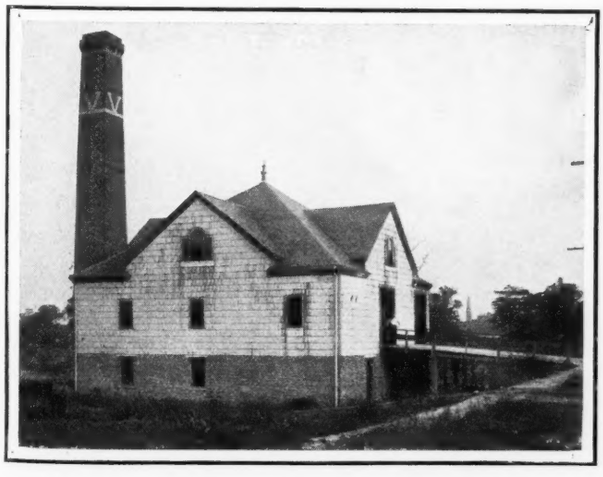


FIG. 33.—DIXON CREMATORY, SOUTH BEND, IND.

The official trial, made on May 3, 1906, by Messrs. Ross and Holgate, Consulting and Supervising Engineers, Montreal, was reported at length in the Municipal Journal of May 24, 1906. The following table shows in a condensed form the average of the results obtained:

Official Test, Westmount Destructor

Duration of test	8 hrs. 32 min.
Number of cells	3
Total grate area	75 sq. ft.
B. & W. Boiler, heating surface	2,197 sq. ft.
Refuse consumed (composition of waste material):	
Garbage, manure and leaves	15%
Ashes and unburnt [anthracite] coal, cinders, etc.	65%
Iron, wood, bottles, tins, leather, etc.	5%
Refuse, including paper, branches, old furniture, etc.	15%
Total	100%
WEIGHTS	
Unscreened refuse, rubbish, garbage, manure, etc.	38,090 lbs.
Tins, etc., not burned	540 "
Net amount consumed	37,550 lbs.
Refuse consumed per hour	4,402 "
" " " " per sq. ft. of grate	58.7 "
Weight of clinker remaining after combustion	15,880 "
Percentage of clinker and ashes to refuse consumed	42.1%
WATER EVAPORATION	
Total water evaporated	41,991 lbs.
Water evaporated per hour, actual	4,920 "
" " " " from and at 212° F.	5,970 "
" " " lb. of refuse, actual	1.12 "
" " " " " " from and at 212° F.	1.36 "
Water evaporated per lb. of refuse from and at 212° F. and per sq. ft. of total heating surface per hour	2.72 "
PRESSURES AND TEMPERATURES	
Temperature of the outside air, average	55° F.
Barometric pressure, average	29.5 ins.
Average steam pressure	123.5 lbs. sq. in.
" pressure in ash pits	1.74 ins.
" vacuum at chimney base	9/16 in.
" temperature of combustion chamber (by Watkins heat recorders)	over 1,994° F.
Highest temperature of combustion chamber (Copper melted in 1¼ minutes—wrought iron was also fused.)	over 2,318° F.
Lowest temperature in combustion chamber	1,742° F.
Average temperature of air entering regenerator	75° F.
" " " " leaving "	206° F.
" " " gases entering "	427.5° F.

Operating Expenses and Net Unit Cost

There were four men employed in the operation of the destructor for feeding, leveling and clinkering, as well as looking after the boiler, but this number will be reduced to three in the near future. The wages paid are: One man at 25 cents an hour and three men at 20 cents an hour. The 20 (long) tons of refuse per day are disposed of in about ten hours, so that at present only one shift is required, and the labor charge for destruction amounts to about 42½ cents per (long) ton.

To obtain the net cost of destruction the capital charges and labor costs must be added, and the sum of the amounts obtained from the sale of steam and by-products subtracted from the total. The net costs so found, divided by the tons consumed per year, will give the average cost per ton.

If this is worked out on the basis of the figures furnished in the estimates of Mr. F. L. Fellowes, City Engineer, the net unit cost per ton of waste destroyed will be 10.7 cents.

REPORT WESTMOUNT DESTRUCTOR, SIX MONTHS, 1906

Months 1906	Mixed Ashes Garbage *Loads*	Manure *Loads*	Rubbish *Loads*	Ashes Separately *Loads*	Dead Dogs	Dead Cats
May.....	690	33	39	92	14	29
June.....	571	15	25	30	22	20
July.....	434	56	7	17	25	48
August.....	307	40	21	3	11	10
September...	500	50	7	12	13	28
October.....	640	42	45	13	9	24
Totals.....	3,082	236	144	167	94	159

"This is about five and one-half millions pounds of refuse consumed (at 1,500 pounds per load) in the six months, or an average of about 35,000 pounds per day, as the Destructor was seldom operating on Sunday. As far as the summer months go the Destructor has handled very wet garbage in a most satisfactory way and very little difficulty has been experienced in consuming such difficult materials as consecutive loads of almost pure manure, etc. Very little ashes were received from May to September." (Messrs. Ross & Holgate, Nov. 21, 1906.)

These reports are also intended to show the working of the various installations at their average or normal rate under ordinary conditions. They exclude the extremes of large quantities destroyed in limited time at small cost, and quantities lowered by poor management consumed under distinctly unfavorable conditions, where the expense of working is greatly increased beyond the normal.

At every one of the installations cited there have occurred instances wherein the quantities destroyed and the operating cost have been far below or greatly in excess of the particular case given, but these instances do not, in the opinion of the writer, give a fair idea of the average performance of the furnaces. They are too often used by friends or opponents for or against certain crematories or incinerators, and, although both parties may be technically correct in their statements, yet none should be taken as presenting a fair, impartial description of the situation.

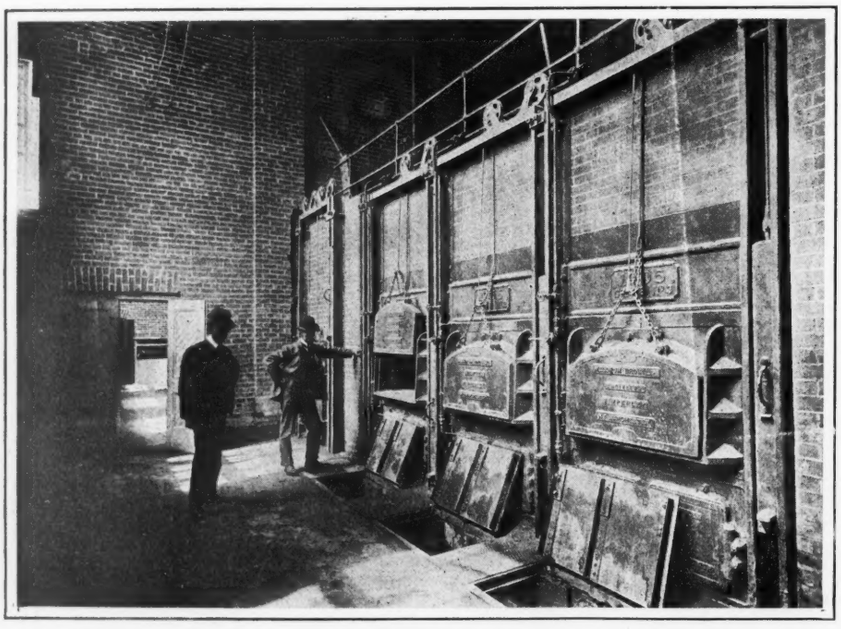


FIG. 35.—FRONT OF DESTRUCTOR, SHOWING STOKING AND ASH-PIT AND DOORS FOR CLINKER, WESTMOUNT

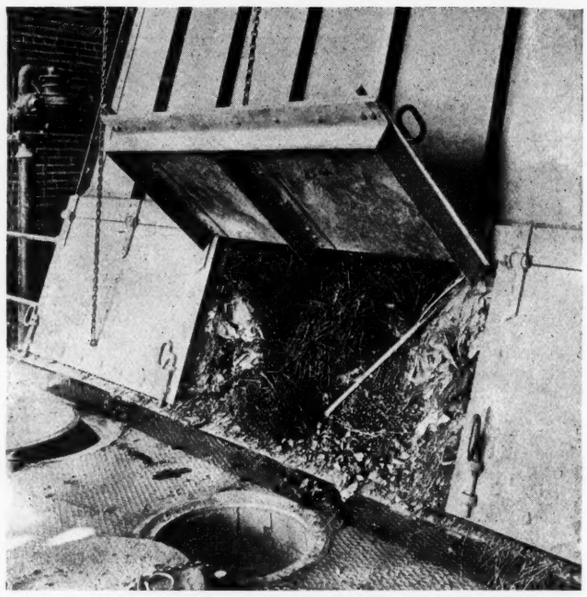


FIG. 34.—RECEIVING BINS AND CHARGING HOLES, MELDRUM DESTRUCTOR, WESTMOUNT, CANADA

It is also necessary, in contemplating the cost of installation and maintenance, to take into consideration the varying circumstances of climate and latitude, the character of the population, methods of collection, nature of the waste, and other important factors that influence the work of waste disposal by incineration.

In this table (XXXI.) are brought together the various reports cited in the previous article. If the Atlantic City report be omitted (as it can well be since no furnace of this class is now at work), there will then remain seven different forms of cremating furnaces, which illustrate the largest number of active furnaces now in use in the United States and Canada.

These, again, can be separated into two general types of construction, the first four of the number representing the prevailing designs of the American crematory, with horizontal grates, and employing the secondary fire or "fume cremator," for destroying gases of combustion from the first, or primary fire.

Of the remaining three examples, two follow the design of the cell pattern used in Great Britain, and one—the last—is an English Destructor of an original type.

While this table is necessarily incomplete and imperfect, it may still illustrate the distinctions between the two general types referred to in the Trenton report.

OTHER OPERATING CREMATORIES

Besides the eight types of garbage furnaces reported in the foregoing accounts, there are about eight other methods now in ser-

Table XXXI. RECAPITULATION OF REPORTS ON OPERATING CREMATORIES

Date of Construction	Installations	Cost of Operating	Character of Waste Destroyed	Fuel Employed	Daily Capacity of Furnace	Remarks
	Engle, S. & Co.—					
1893	Chicago, Ill.....	$0.71	Garbage and sewage sludge.	Petroleum..	100 tons....	2 furnaces; operated under forced draft.
1892	Richmond, Va.....	.69	Refuse and animals..	Coal.....	40 " ...	Natural draft.
1892	Norfolk, Va.....	.50	Garbage and refuse...	Coal.....	25 " ...	Natural draft.
	Smith-Siemens—					
1894	Atlantic City, N. J..	1.48	Garbage and refuse...	Prod'c'r gas	100 tons ...	10 cells. Gas generated at plant.
	Dixon Co.—					
1904	St. Louis, Mo.....	.43⅓	Garbage, refuse, night soil, animals.	Coal and coke	60 tons ...	2 creamatories.
1906	Shreveport, Ia.....	.48⅔	Garbage and refuse...	natural gas .	25 " ...	1 creamatory.
	Davis Company—					
1899	Trenton.....	.62	Garbage and refuse...	coal and coke.	53 tons ...	1 furnace. Another cell added 1906.
	DeCarie Co.—					
1904	Spokane, Wash.....	.62	Garbage, refuse and manure.	Coal, coke, wood, sawdust, edgings.	30 tons ...	1 incinerator.
	Wright—					
1901	Chicago, Ill.....	.30	Garbage, refuse, ashes	No fuel.....	35 tons ...	2 cells; forced draft. Crediting value of power. Operating cost, 15 cents ton.
	Thackeray—					
1894	Montreal, P. Q.....	.39	Garbage, refuse, and ashes.	No fuel.....	150 tons ...	12 cells, natural draft.
1898	San Francisco, Cal..	.15 (?)	Garbage, refuse, and ashes.	No fuel.....	600 " ...	32 cells. Present cost of operating 20 cents per ton; natural draft.
	Meldrum Co.—					
1906	Westmount, Canada	.41	Garbage, refuse, and ashes.	No fuel.....	50 tons....	3 cells, or grates; forced draft. Crediting value of steam power; operating cost, 10 cents per ton

vice, of which no report can be obtained for publication. In the order of their construction these are: Brownlee Cremator, Coriscana, Tex. (1892); Mackay Cremator, Yonkers, N. Y. (1893); Andrew Engle Cremator, Wichita, Kan. (1898); Pearce-La Chapelle Cremator, Ottawa, Ill. (1900); Morse-Boulger Destructor, Manila, (1902); Sanitary Engineering Company, New York, Long Branch, N. J. (1902); Pearson Incinerator, Charleston, W. Va. (1904).

Their plan of construction follows the same general design of the other furnaces of the American type, and from the best obtainable accounts the methods of working, and the operating expenses, are very nearly the same as the examples already given.

There have been about sixteen other garbage furnaces of different designs built from 1885 to 1900, mostly experimental in character. Several of these were large and expensive constructions, but none was successful in obtaining a foothold in the disposal field; they contributed but little to the knowledge of the subject, and are not considered in the present list of operating plants.

To give a comprehensive view of the disposal work done by incineration from the beginning in this country, the next article will contain a chronological list of every municipal cremating furnace built from 1885 to the present date, with details in regard to each.

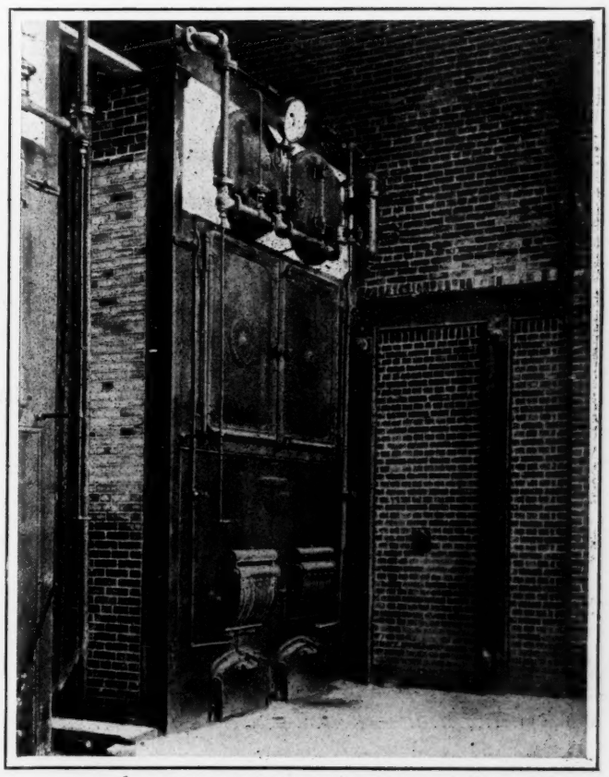


FIG. 36.—REFUSE FIRED 200-H.P. BABCOCK-WILCOX BOILER, CONNECTED WITH DESTRUCTOR, WESTMOUNT.

THE WEEK'S CONTRACT NEWS

Relating to Municipal and Public Work—Street Improvements—Paving, Road Making, Cleaning and Sprinkling—Sewerage, Water Supply and Public Lighting—Fire Equipment and Supplies—Buildings, Bridges and Street Railways—Sanitation, Garbage and Waste Disposal—Police, Parks and Miscellaneous—Proposals and Awards

BIDS ASKED FOR

STATE	CITY	RECEIVED UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
Street Improvements				
Minnesota	Duluth	December 7, 10 A.M.	Grading, paving, sewer, 24th Ave	Board of Public Works.
Indian Territory	Tulsa	December 7, noon	Laying 15,630 yds. vitrified brick paving and 1,514 feet cement curb	J. G. Patten, City Engineer.
Nebraska	Omaha	December 8, noon	Constructing 7 miles of road on six roads	D. M. Haverly, Co. Clerk.
Ohio	Delaware	December 8, noon	Grading and paving with vitrified block, 1,260 sq. yds.; 1,015 ft. straight and 455 ft. circular curb and 871 cu. yds. excavation	E. S. Mendenhall, Co. Surveyor.
New Jersey	Atlantic City	December 10, 3:30 P.M.	Various kinds of paving	J. W. Hackney, City Engineer.
Ohio	Cincinnati	December 10	Grading and paving Werk rd., cost, $24,197 Colerain ave., granite block, $67,285	C. N. Dannenhower, Ch. Eng'r.
Ohio	Addyston	December 11	Improving and paving Cincinnati Avenue	W. T. Coleman, City Clerk.
Pennsylvania	Philadelphia	December 12, noon	Laying asphalt and granolithic walks	Chief, Bureau of Water.
New Jersey	Newark	December 12, 3 P.M.	Paving 9½ miles road in Essex County	Thomas McGowan, Director.
Ohio	Troy	December 12	Laying 2,700 sq. yds. vitrified brick, asphalt, or bitulithic and 3,000 ft. curb	H. J. Walker, City Engineer.
New York	New York	December 18, 11 A.M.	Grading curb, etc., two streets	Louis F. Haffen, Boro. Pres.
Ohio	Cincinnati	December 19, noon	Grade, macadamize, etc., Stanley Avenue	M. J. Keefe, Clk. Bd. Pub. Serv.
Ohio	Madisonville	December 24	Macadamizing Clason St. and Stewart Place.	J. A. Conant, Village Clerk.
Iowa	Oskaloosa	January 1	Paving street	C. E. Monroe, City Clerk.
Indiana	Princeton	February 1	Constructing 11 miles of gravel road	Harry R. Embree, Co. Aud.
Water Supply				
New York	New York	December 5, 2 P.M.	Wrought iron or steel pipe and fittings	John H. O'Brien, Com'r.
North Dakota	Bismarck	December 6, 2 P.M.	Constructing water system at Indian School.	Commissioner of Indian Affairs, Washington, D. C.
Louisiana	Fort St. Philip	December 7, noon	Constructing 11 cypress cisterns	Capt. B. T. Clayton, Q. M.
Arkansas	Eureka Springs	December 8	Improving water and sewer systems; cost, $17,000	Nicholas Nizer, Commissioner.
Texas	Fort Bliss	December 10, noon	Sinking 12-in. tubular deep well, installing pump and constructing shelter and trestle and 150,000 gal. steel tank on 70-ft. trestle.	Lt. C. O. Schudt, Quartermaster.
New York	Troy	December 11, noon	Constructing spillway, incl. 3,700 cu. yds. concrete, 21,700 lbs. reinforcing rods, 3,200 sq. rods brick pavement, 25,000 cu. yds. excavation, 80-ft. bridge and 1¾ mi. gravel'd roads	Henry Schneider, Com'r Pub. Works.
Missouri	Plattsburg	December 11	Constructing water works system	Geo. Cadogan Morgan, Chicago, Eng.
Pennsylvania	Spring City	December 12, noon	Reservoir and artesian wells at Institution for Feeble Minded and Epileptic	Philip H. Johnson, Land Title. Bldg., Philadelphia, Arch.
Texas	Fort Worth	December 15, 2 P.M.	Air compressor and auxiliaries, 3,000 cu. ft. capacity, also two 3,000,000-gal. high-duty pumps	John B. Hawley, City Engineer.
Ontario	Fort William	December 15, 6 P.M.	Constructing 500 ft. 36-in. steel intake pipe, 4,500 ft. concrete-lined tunnel, 4,000 cu. yds. excavation, concrete for bay, valves, etc.	H. S. Hancock, Town Engineer.
Cuba	Guantanamo	December 19, 11 A.M.	Constructing steel stand pipe with fittings, etc. U. S. naval coal depot	Bureau of Equipment, Navy Dept., Washington, D. C.
Illinois	Chicago	December 22	Constructing four pumping engines, 24,000,000-gals capacity	Wm. L. O'Connell, Com. Pub. Wks.
Oregon	Klamath Agency	December 28, 2 P.M.	Constructing water system	Horace G. Wilson, Superintendent.
Louisiana	Jonesville	January 2	Sinking an artesian well	T. M. Mathews, Mayor.
Missouri	Rolla	January 7	Constructing waterworks system	McRae & Harris, Engineers.
Indiana	Elkhart	January 10	Waterworks system franchise with city option buying	E. L. Arnold, Pres. Bd. Pub. Wks.
Illinois	Kangley	January 22, 4 P.M.	1,840 ft. 4-in. pipe, 1,780 ft. 2-in. pipe connections, valves, hydrants, etc	Geo. Clay, Village Clerk.
Louisiana	New Orleans	January 23, 3 P.M.	38,000 tons, 4 to 42-in. cast-iron pipe and 1,100 tons of specials; also for hauling and laying same	Geo. G. Earl, Gen. Supt. Water Bd.
Sewerage				
Ohio	Lebanon	December 7, noon	Constructing 3,380-ft. trunk sewer, also main sewer 680 ft. long	M. E. Gustin, Village Clerk.
Alabama	Avondale	December 7	Constructing sewer system	W. R. Starbuck, Mayor.
Ohio	St. Clair Heights	December 8	Constructing lateral sewer system	Chas. Limberger, Village Clk.
Pennsylvania	Spring City	December 12, noon	Sewer system, Institution for Feeble Minded.	P. H. Johnson, Philadelphia, Arch.
Massachusetts	Boston	December 14, 2:30 P.M.	Constructing part, Section 85, Extension of High Level Sewer, 1,200 ft. 69 x 72 in. sewer, 1,400 cu. yds. concrete masonry, etc	Wm. M. Brown, Engineer.
New York	West Seneca	December 15, 2 P.M.	Constructing sewer system, pumping and disposal plants; inc. 45,000 ft. 8 to 30-in. tile, also iron pipe to sewer, 1,900 acres; disposal plant to cover area 75,000 sq. ft., etc	Dennison Fairchild, Buffalo, Eng'r.
Ohio	Steubenville	December 15	Constructing 12-in. sewer in two streets	T. W. Vance, City Clerk.
California	San Francisco	December 17	Constructing sewers; cost, $1,000,000	Thos. P. Woodward, City Eng'r.
New York	New York	December 18, 11 A.M.	Sewers and appurtenances, five streets	Louis F. Haffen, Boro. Pres.
Nebraska	Fairbury	December 18, 6 P.M.	Constructing sewer lateral; estimate, $3,600	F. L. Rain, City Clerk.
Ohio	Cleveland	December 18	Constructing sewer in Fairfax road	F. A. Pease, Eng'r Co. Cleveland.
Florida	Gainesville	December 18	Constructing sewage disposal plant	Wm. W. Lyon, Consulting Eng'r.
Ohio	Cincinnati	December 19, noon	Building sewers and drains in seven streets, estimated cost, $32,509	C. N. Dannenhower, Engineer.
Minnesoto	Hibbing	December 18	Sewer system, inc. 30,411 yards earth and 882 rock excavation, 14,000 ft. various size pipe, 47 manholes, flush tanks, catch basins, etc	Miles Gaudsey, Village Recorder.
Oregon	Klamath Agency	December 28, 2 P.M.	Constructing sewer system	Horace G. Wilson, Superintendent.
New York	Syracuse	January 2	Constructing sewer system, Elmwood Dist.	H. H. Brewster, Engineer.
Manitoba	Winnipeg	January 4	Constructing $72,000 concrete trunk sewer	H. N. Ruttan, City Engineer.
Ohio	St. Mary's	January 30	Complete sanitary sewer system, 14 miles	Riggs & Shermann, Toledo. Eng'rs.

Public Buildings

Kentucky	Coal Run	December 7	Erecting $15,000 school building	J. R. Redwine, Superintendent.
Arkansas	Eureka Springs	December 8	Erecting $18,000 police station and City Hall.	Samuel Bell, City Engineer.
Connecticut	Hartford	December 9, noon	Constructing State armory and arsenal	Benj. W. Morris, New York, Arch.
West Virginia	Hinton	December 10	Erecting high school	J. B. Stewart, Huntington, Arch.
Pennsylvania	Carlisle	December 10	Erecting hospital building at Indian school	Maj. Wm. A. Mercer, Superintendent
Texas	Galveston	December 10	Installing heating plant at county jail	J. M. Murch, Auditor
Illinois	Chicago	December 11, 11 A.M.	Erecting brick and stone fire-engine house	Wm. L. O'Connell, Com. Pub. Wrks.
Pennsylvania	Philadelphia	December 11	Erecting municipal hosp. bldgs.; cost, $750,000	W. M. L. Coplin, Dir. Dept. Pub Health and Charities.
Florida	West Palm Beach	December 11	Erecting $50,000 school	Guy Metcalf, Sec'y Bd. School Trus.
Kentucky	Louisa	December 11	Erecting $25,000 hospital building; 4 story, 60 x 120 ft.	Lawrence County Com'rs.
Kentucky	Whitesburg	December 12	Erecting $20,000 school building	Dr. Barrett.
New York	Middletown	December 12, 3 P.M.	Two 150 h. p. boilers, State Hospital	T. E. McGarr, Capitol, Albany.
Idaho	Boise	December 15, 11 A.M.	Erecting four buildings, electric wiring, etc.	Maj. R. B. Turner, Q. M.
District of Columbia	Washington	December 15, 2 P.M.	Steel framing U. S. Senate office building	Elliott Woods, Supt. Capitol.
Kentucky	West Liberty	December 20, 10 A.M.	Erecting a Court House	Court House Building Committee.
Ohio	Columbus	December 20, noon	Technical bldg., Girls' Industrial Home	Marriott & Allen, Architects.
Louisiana	Shreveport	December 20	Erecting $75,000 City Hall	C. G. Rives, City Comptroller.
Ohio	Columbus	December 24	Erecting amphitheater on State Fair Grounds to cost $45,000 or $50,000	Linthwaite & Holbrook, Archs.
Illinois	Princeville	December 26	Erecting 8-room brick school building	Parr & Hulsebus, Peoria, Archs.
Georgia	Cordele	December 31	Two-story Court House and jail; cost, $80,000	Lockwood Bros., Columbus, Archs
Wisconsin	Brodhead	December 31	Erecting $30,000 High School	F. H. Kemp, Beloit, Architect.
Iowa	Leon	February 1	Erecting $75,000 Court House	A. S. Thorp, Clk. Dist. Court.
Virginia	Richmond	February 1	Fire-proof high school building, 180 x 220 ft.; estimated cost, $500,000	Charles W. Bryant, Architect.
North Dakota	University	February 5	Library building State Univer'y, cost, $60,000	J. W. Wilkerson, Sec'y Bd. Trustees.
Ohio	Marion	April 1	Four-story addition to school; cost, $10,000.	Geo. B. Christian, Jr. Clerk., Bd. Ed

Bridges

Missouri	Kansas City	December 10	Building six 12, 14, 16 and 20-ft. I-beam steel bridges; also reinforced concrete top for bridge	Oscar Koehler, Bridge Com'r.
New York	New York	December 13, 2 P.M.	Constructing viaduct, Queens approach, Blackwell's Island bridge	J. W. Stevenson, Bridge Com'r.
Indiana	Newport	December 15, 10 A.M.	Building highway bridge over Wabash River.	H. T. Payne, County Auditor.
Tennessee	Carthage	December 15, noon	Constructing 600-ft. steel highway bridge	W E. Myer, Agent.
South Dakota	Sioux Falls	December 15	Erecting and repairing all bridges	C. E. Hill, County Auditor.
Massachusetts	Fall River	December 17, noon	Building steel bridge, 920 ft. long, stone piers and abutments, approaches, etc.	Jas. F. Jackson, Chm. Joint Bd. State House, Boston.
New York	Albany	December 19, noon	Building bridges, State barge canal work	H. A. Van Alstyne, State Eng'r.
West Virginia	Charleston	December 20	Constructing highway bridge	J. F. Hudson, Chm. Bridge Com.
Illinois	Chicago	December 21, 11 A.M.	Erecting N. Halsted St. canal bridge	Wm. L. O'Connell, Com. Pub. Wrks.
Ohio	Toledo	December 27	Erecting two bridges	Lucas County Commissioners

Miscellaneous

New York	Brooklyn	December 6, 3 P.M.	Erecting shelter houses in three parks	Moses Herrman, Park Dept.
New Jersey	North Bergen	December 6, 8 P.M.	Removal of Garbage, Fifth District	Emil J. Foerch, Town Clk.
Iowa	Des Moines	December 10	2,000 ft. 2½-in. cotton hose, coupled	Geo. F. Poorman, City Clerk.
Kentucky	Pikeville	December 10	Improving electric light plant; cost, $10,000.	Pikeville Light Company.
Virginia	Norfolk	December 11, 10 A.M.	Steel store-house 199 ft. 10 ins. long with railroad track, fresh water tank, etc.	Bureau of Supplies and Accounts Navy Dept., Washington, D. C.
New York	New York	December 11, 10:30 A.M.	3,000 ft. 3-in. rubber fire hose	F. J. Lantry, Fire Com'r.
Pennsylvania	Philadelphia	December 12, noon	Repairs to engines, etc., removing engine, hauling pipe and machinery, etc	J. R. Hathaway, Dir. D. P. W.
Ohio	Cincinnati	December 12, 1 P.M	Reconstructing, in concrete, conduit, guide and guard cribs, Lock No. 4	Maj. J. G. Warren, Custom House.
Ohio	Toledo	December 13	Four second-size fire engines, two trucks	I. E. Knisely, Bd. Pub. Safety.
Ohio	Canton	December 14, noon	Improving fire alarm and police telephone and telegraph systems	Henry Paulus, Clk. Bd. Pub. Safety.
Indiana	Vevay	December 17, 2 P.M.	Boiler and engine to operate generator	City Council.
New Jersey	Mt. Holly	December 18	Furnishing 12 arc lamps, 5 amperes, at 110 volts, and 200 incandescent lamps, 20 c. p., for lighting streets, for 1, 3 and 5 yrs. after April 1	Harry Hawkins, Jr., Township Clk.
District of Columbia	Washington	December 26	Electric plant for equipping Capitol and other buildings	Elliott Woods, Superintendent.
New York	New York	December 27, noon	Building crematory or refuse destructor	George Cromwell, Borough Pres.
Mississippi	Greenville	December 31	Building 61-mile line for Greenville, Leland and Rolling Forks. Co. Railway	W. R. Barkesdale, Memphis, Tenn., President.
Kentucky	Carrollton	December 31	Dynamo, engines and new boilers for electric-light plant: to cost $25,000	R. L. Bartlett, City Electrician.

STREET IMPROVEMENTS

New Albany, Ind.—Council is preparing to pave certain portions of Malest street.

Des Moines, Ia.—The Barber Asphalt Company has been awarded contract, at $1.82 per square yard, for paving West Twenty-seventh and West Fifth streets with asphalt.

Dubuque, Ia.—Bluff street will be paved from Third to Eighth streets, at $10,560.—Edmund A. Linehan, City Recorder.

Atchison, Kan.—R. J and W. M. Boyd Construction Company, of Kansas City, has secured contract for grading, curbing, and paving with brick Park street, at the following bid: 5,000 cubic yards grading, 35 cents; 863 lineal feet curb, 35 cents; 1,208 square yards brick paving, $1.25; 414 square feet brick sidewalk, 15 cents; 3,426 square feet sidewalks relaid, 2½ cents; 2 sewer inlets, each, $35; 1 sewer inlet, $40; 150 lineal feet 12-inch sewer, 70 cents; 70 lineal feet 15-inch, 80 cents; 1 manhole adjusted, $10; total, $3,998.

Kansas City, Kan.—About one mile of brick paving and two miles of asphalt will be laid.—R. A. McAlpin, City Clerk.

Ottawa, Kan.—Council is arranging to pave certain streets with brick.

Louisville, Ky.—The Board of Public Works of New Albany is enacting the preliminary legislation for paving Market street with vitrified brick or asphalt; the street is a very long one, and the job will be an important one.

Newport, Ky.—Cement curbs and gutters have been ordered constructed on Fifth, Brighton, Tenth, Robert, Elm, and Second streets.

Baltimore, Md.—The city will expend $500,000 for widening Calvert street between Monument square and Read street.—B. T. Fendall is City Engineer.

Grand Rapids, Mich.—Emory Anderson and Company, Cleveland, O., bid par and a premium of $1,203.50 on issue of $160,000 street improvement bonds, and par with $601.25 premium for $80,000 issue for sewers, making a total of $1,804.75 for the $240,000 issue, and were awarded the contract.—Mayor Ellis, Chairman, Special Committee.

Manistee, Mich.—The city will expend $16,000, paving Manistee street.

Richland, Mich.—Council is preparing to pave several streets.

Natchez, Miss.—A committee has been appointed to secure specifications for paving several streets.

Kirkwood, Mo.—Webster avenue is to be improved at a cost of $6,000.

Reno, Nev.—The matter of issuing $200,000 bonds for improvement of streets is under consideration.

Newark, N. J.—An additional contract for 3,500 square yards of bitulithic has been awarded the Standard Bitulithic Company, of New York City.

Akron, O.—The Street Committee has reported in favor of paving Cuyahoga street; the estimates are: brick, $44,000; macadam, $36,000; cement sidewalks, $10,000.

Bellevue, O.—Council will probably decide on the paving of High street; the total frontage is about one mile, and it is proposed to pave early in the spring; ordinances to levy assessment for improving Monroe street by grading, ballasting, and paving, setting curbs, gutters, and retaining walls, constructing catchbasins and drains have passed Council.—Geo. Lieber, Clerk.

Canal Dover, O.—Resolutions to pave the alley running off of Factory street have passed the Council.

Celina, O.—The township trustees will probably authorize the construction of cement walks to the two cemetaries of this city, to cost $1,700.

Cincinnati, O.—W. H. Settle and Company have been awarded the contract by the village of Madisonville for the improvement of Clason street, at their bid of $10,000.

Cleveland, O.—Council has decided to grade, drain, curb and pave East 61st street, Cowan, East 48th and East 64th streets, East 66th place, Doroy road, and Carpenter avenue; material to be paving bricks; bids will soon be invited; the paving of Glenwood avenue and Butler avenue with paving brick, according to the plans of the Engineer, will be undertaken early in the spring.

Dayton, O.—Chas. F. Sullivan has the contract for paving the sidewalks on Holt avenue; bond issues for paving Van Biren, Hess, Chestnut, Brown, Main, Jones, Cass, Webster and Sears street have passed Council.—Calvin D. Wright, Mayor.

CONTRACTS No. 1 AND No. 2 AWARDED BY THE BALTIMORE SEWERAGE COMMISSION FOR CONSTRUCTION OF SECTION No. 1 OF THE OUTFALL SEWER TO M. A. TALBOTT & CO.

QUANTITY AND ITEM	CONTRACT No. 1			CONTRACT No. 2		
	Quantity	Price	Amount	Quantity	Price	Amount
Excavation and refill in trench or tunnel for 10 ft. 9 in. by 12 ft. horse-shoe shaped sewer	3,885 ft.	$14.40	$55,944.00	.....	.....	.....
Excavation and refill in trench or tunnel for 11 ft. by 12 ft. 3 in. horse-shoe shaped sewer	.....	.....	.....	3,092 ft.	$12.00	$37,104.00
Rock excavation in trench	50 cu yds.	5.00	250.00	50 cu. yds.	5.00	250.00
" " in tunnel	50 "	6.00	300.00	50 "	6.00	300.00
Excavation and refill for Bellmouth	726 "	0.90	653.40	.....	.....	.....
Embankment	880 "	0.10	88.00	2,672 cu. yds.	0.10	26.72
Extra excavation	25 "	2.00	50.00	25 "	2.00	50.00
Gravel refill	25 "	2.50	62.50	25 "	2.50	62.50
Ordinary brick masonry in Portland cement	925 "	16.00	14,800.00	747 "	16.00	11,952.00
Vitrified " " " " "	25 "	20.81	520.25	20 "	20.81	416.20
"Class A" concrete masonry (1:2:4)	5,000 "	9.50	47,500.00	4,053 "	9.50	38,503.50
"Class B" " " (1:2:5)	4,090 "	8.50	34,765.00	3,277 "	8.50	27,854.50
Reinforced concrete masonry	100 "	12.00	1,200.00	10 "	12.00	120.00
Dimension stone masonry	2 "	20.00	40.00	2 "	20.00	40.00
6-inch underdrain	100 ft.	0.30	30.00	100 ft.	0.30	30.00
8-inch "	200 "	0.40	80.00	200 "	0.40	80.00
10-inch "	1,000 "	0.50	500.00	1,000 "	0.50	500.00
8-inch bevel-connection	1	2.00	2.00	1	2.00	2.00
10-inch " "	1	2.25	2.25	1	2.25	2.25
12-inch " "	1	2.50	2.50	1	2.50	2.50
15-inch " "	1	2.75	2.75	1	2.75	2.75
18-inch " "	1	3.50	3.50	1	3.50	3.50
24-inch " "	1	4.50	4.50	1	4.50	4.50
8-inch stand-pipes	10 ft.	2.00	20.00	10 ft.	2.00	20.00
10-inch "	10 "	2.50	25.00	10 "	2.50	25.00
12-inch "	10 "	4.00	40.00	10 "	4.00	40.00
15-inch "	10 "	5.00	50.00	10 "	5.00	50.00
18-inch "	10 "	6.00	60.00	10 "	6.00	60.00
Sheeting left in place	70 M. "	20.00	1,400.00	55 M. "	20.00	1,100.00
Lumber in foundation	5 M. "	45.00	225.00	5 M. "	45.00	225.00
Piles in place	100 "	0.80	80.00	100 "	0.80	80.00
Siphon	.....	3,000.00	3,000.00	.....	.....	.....
Slope paving	.....	.....	.....	100 sq yds.	2.00	200.00
Manhole heads and covers in place	6	15.00	90.00	7	15.00	105.00
Galvanized wrought iron manhole steps	116	0.27	31.32	92	0.27	24.84
Total amount of bid			$161,821.97			$119,236.76
Number of working days required for completion	350			350		

SEWERAGE

Chicago, Ill.—The Trustees of the Sanitary District will soon offer for sale $500,000 serial two to nineteen-year 4 per cent. bonds.

Litchfield, Ill.—Council has adopted plans for a sewer system; estimated cost, $70,000.

Pekin, Ill.—The proposed sewer will cost $112,000.—Benjamin F. Smith, Engineer.

Covington, Ind.—The contract for constructing 7,500 feet 12-inch sewer, including catchbasins, has been awarded to J. A. Hardin and Company, of Anderson.

Michigan City, Ind.—Arthur H. Snyder was low bidder for constructing sewer in Tennessee street, at 59 cents per lineal foot; Peter Michaeby and E. P. Hannahan were the other bidders.—H. M. Miles, City Engineer.

Des Moines, Ia.—Contract for constructing the Grand View sewer system has been let to O. P. Herrick, at $2.24 7-8 per foot; the sewer is to be about 34,000 feet long, and will cost about $75,000.

Sibley, Ia.—The matter of installing a complete system of sewers is under consideration.

Gloversville, Ky.—Bids will be called for early next spring for the proposed sewage disposal plant; cost, $150,000.—Morrill Vrooman, City Engineer.

Louisville, Ky.—The citizens voted on November 6 in favor of constructing the proposed sewerage system; it will be 60 miles in length, and cost about $4,000,000.—J. B. F. Breed, Chief Engineer, and Peter Lee Atherton, Chairman Sewer Committee.

Paducah, Ky.—Council has directed the City Engineer to prepare estimates for building sewers.

New Orleans, La.—The citizens have voted in favor of constitutional amendment No. 1, authorizing the city to issue $8,000,000 additional public improvement bonds to complete the three systems of sewerage, water, and drainage.

Portland, Me.—Worster and Wilson have been awarded contract to lay about 340 feet of pipe sewer on Deane street, at $1,936.20; other bidders were John W. Gulliver, Angello Lorello, and R. D. Shannahan.—Commissioner of Public Works **Fernald.**

Kalamazoo, Mich.—The Chicago Drainage Company has offered to drain the Big Marsh at a cost of $10,000; the townships of Pavillion and Comstock will pay the bill; the ditch will be six miles long.

Independence, Mo.—A vitrified pipe sewer, to cost $15,000, will be constructed.—J. A. Prewitt, City Clerk; R. T. Proctor, City Engineer.

Beatrice, Neb.— — The Rocklef and Gibson Construction Company, St. Joseph, Mo., have contract for constructing sewers, at $3,684.

Fairbury, Neb.—King and Lambert were low bidders on work in Sewer District No. 7, at $4,522.50, as follows: 6,200 feet 8-inch clay tile sewer and 200 feet 6-inch clay tile sewer, clay and gravel excavation, 59¼ cents per lineal foot, mean of all bids, 66 2-7 cents; manholes, $4.90; flushtanks, including flushing appliance, $150; wages of common labor, 20 cents per hour; other bidders were, Lang and Browett, T. W. Roberts, Rocklef and Gibson, F. S. Dobson, C. P. Hutchinson, and Geo. S. Kelbreth.—W. W. Walton, City Engineer.

Omaha, Neb.—The citizens voted to issue $150,000 bonds for constructing sewer; bids will be called for in the early spring; R. L. Kennedy and Company have contract for constructing Walnut Hill sewer, at $18,063.—Andrew Rosewater, City Engineer.

Erie, Pa.—Mayor Liebel has signed the ordinance for the construction of a nine-inch lateral tile sewer in Popular street, costing $1,600; he also approved the report of the City Engineer for a 20-inch sewer in Cascade street; estimated cost, $5,000; John Thornton has the contract for 900 feet of sewer on Twenty-first street; 12-inch pipe will be used.

Jenkintown, Pa.—The Board of Health has made a strong recommendation for the construction of a sewer system; estimated cost, $60,000.

Lebanon, Pa.—Council is considering the extending and improving the sewerage system.

WATER SUPPLY

London, Ky.—Plans have been prepared for the construction of a water system, to cost $15,000.—C. R. Baugh, Chairman of the Board of Trustees.

Murray, Ky.—The city is considering the construction of waterworks and an electric-lighting plant.

Owensboro, Ky.—The town has voted in favor of issuing $60,000 worth of bonds for extending the water mains.

Pineville, La.—Plans are being prepared for a system of waterworks; estimated cost, $16,000.—Ira W. Sylvester, Alexandria, Engineer.

Winthrop, Me.—The city proposes to secure an adequate water supply.

Belding, Mich.—Council has decided to build a settling basin for a water plant.

Hancock, Mich.—The water supply is inadequate; improvements are contemplated.

Muskegon, Mich.—John H. Bloomfield, of Bay City, has prepared plans for improving the water system; the plans include the purchase of pumping plant with a daily capacity of six million gallons.

Port Huron, Mich.—The Water Board will ask Council to purchase a new pumping engine; the present pumps are inadequate.

Webb City, Mo.—The Webb City and Cartersville Waterworks Company has decided to extend water mains; estimated cost, $25,000.—Geo. H. Euen, Superintendent.

Helena, Mont.—The question of issuing $600,000 bonds to bring in a water supply from McClellan creek is under consideration.

Red Lodge, Mont.—An election will be held December 31, to vote on issue of $40,000 bonds for water purposes.—Address City Clerk.

Bloomfield, N. J.—Council will receive new bids for main extension.

Amsterdam, N. Y.—It is proposed to lay a pipe, 12½ miles long.—J. R. Snell, Superintendent.

Rome, N. Y.—Council has decided to lay a main to East Rome; cost, about $16,000.—Ray Armstrong, Superintendent.

Akron, O.—The matter of a municipal water supply is under consideration.

Dayton, O.—The Clerk of the Board of Public Works has been directed to advertise for the waterworks pumping substation at Linden avenue.

East Liverpool, O.—Council is considering issue of $40,000 bonds to install new pumps at the water plant.—A. C. Roe, President of Council.

Newark, O.—An ordinance authorizing an issue in $200,000 bonds for waterworks has passed Council.

Niles, O.—The Shaw Kendall Engineering Company, of Toledo, has the contract for the air compressor for the waterworks plant and the Ft. Wayne Electric Company for electric motor and switchboard; no award has been made on the construction of the plant.

Sandusky, O.—It is estimated that the cost of a filtration plant would amount to $30,000; it has been suggested that an intake pipe be extended out into the lake and that a natural filtration plant rather than an artificial one be constructed.

Portland, Ore.—The Water Board is considering the construction of new distributing mains in many parts of the city.

Punxsutawney, Pa. — The Citizens' Water Company has been incorporated with a capital stock of $100,000 to establish a water plant.—T. M. Kurtz, President.

Belton, S. C.—An election will be held to decide the question of issuing bonds for water system.

American Fork, Utah.—Bonds have been voted to extend the water system.

Walkerville, Ont., Can.—The present water supply system has been condemned by the Board of Health.

LIGHTING AND ELECTRICITY

Ada, Ark.—Bonds, $40,000, have been authorized for the construction of light and water plant.

Cotter, Ark.—A franchise has been granted to W. H. Standish, of Grand Forks, N. D., to install an electric-light plant.

Texarkana, Ark.—The Texarkana Electric and Traction Company has been purchased by the Texarkana Gas and Electric Light Company, a new organization, which will extend the system and put it in good order.

San Diego, Cal.—The Pacific Coast Development and Security Company has been organized with a capital stock of $1,000,000 for the purpose of developing power for light and electricity.—John Campbell, Arthur Small and Frank Turnbull are Incorporators.

Florence, Col. — Council has appointed a committee to inquire regarding the cost of building and equipping a municipal lighting plant.—Address Harry D. Blunt, City Attorney.

Gunnison, Col.—Council is planning to expend $50,000 in improving the electric-light and water plant.

Dover, Del.—The International Light Company has been organized for the purpose of engaging in the manufacture of gas and electric currents for light, heat and power; capital stock, $150,000; incorporators are all of Chicago, Ill.

Milledgeville, Ga.—George D. Case contemplates establishing a gas plant.

Havana, Ill.—Robert Mirke and others have petitioned for a franchise to furnish gas for heating and lighting purposes; estimated cost of improvements, $30,000.

Urbana, Ill.—The Illinois Traction Company will soon commence work on remodeling the Urbana electric-light plant.—L. E. Fisher, General Manager.

Belmond, Ia.—Arrangements are being made to establish an electric-light plant.

Kansas City, Kan.—Council has under consideration the establishment of an electric fire alarm system.

Carrollton, Ky.—The city has voted in favor of a $25,000 bond issue for the purchase and enlargement of the electric-lighting plant and waterworks improvement. — W. F. Schuerman, Mayor.

Iron Mountain, Mich. — Alfred Glass has franchise to install an electric system.

Marquette, Mich.—The Council of the village of Stephenson has granted to T. F. Coulder, of Ingalls, a 30-year franchise for establishing an electric-lighting plant; the plant will be located on the river bank and will be large enough to supply the requirements of the town for many years.

Marshall, Mich.—Alderman Flinn has recommended the enlargement of the municipal light and power plant.

Stephenson, Mich.—T. F. Gulder, of Menominee, proposes to establish an electric-light plant.

Kirkwood, Mo.—H. C. Achtereck has petitioned the Council for gas and electric franchise.

Troy, O.—The Board of Public Service has authorized 53 more arc lights.

FIRE EQUIPMENT AND SUPPLIES

Mobile, Ala.—The Fire Chief recommends that improvements to the city fire protection be made; additional fire apparatus is necessary.

Little Rock, Ark.—Arrangements are being made to build three new fire stations.

Dickson, Ill.—Council has under consideration the improvement of the fire apparatus.

Peoria, Ill.—Council has voted to spend $1,400 for the repair of fire engine; the Ahrends Fire Engine Company will also make improvements in its apparatus.

Rockford, Ill.—Council is preparing to purchase additional equipment and otherwise improve the fire protection in this city; new fire engines will be purchased.

Muscatine, Ia.—The matter of a new fire alarm system is under consideration.—W. H. Buthman, Fire Chief.

Kansas City, Kan.—Council has under consideration an ordinance to establish an electric fire alarm system.

Wichita, Kan.—The Mayor has appointed a committee to ascertain the price for which the city could secure the waterworks plant.

Astoria, Mich.—It is proposed to build a new engine house.

Calumet, Mich.—The Copper Range Railway Company has organized a fire protection in its yards, with Alexander McDougall Foreman.

Muskegon, Mich.—Plans and estimates for the construction of a waterworks system and installation of a new pump are being prepared.—John H. Bloom, Engineer.

Traverse City, Mich. — Arrangemnets are being made to rebuild the dam at the river; a temporary gate will first be erected.

Minneapolis, Minn.—Fire apparatus will be purchased; a new fire hall will be erected at Forty-fifth street and Hiawatha avenue.

Wayzata, Minn.—A volunteer fire company has been organized.—H. J. Bartlett, Chief.

Kenmore, N. Y.—The Committee on Fire has been given authority to purchase a hose wagon.

Lorain, O.—An ordinance has been passed authorizing the issue of $12,500 bonds with which to buy, build and equip a new hose house.

Newark, O.—An ordinance authorizing an issue of $200,000 in bonds for waterworks has been passed by Council.

Pittsburg, Pa. — Director Franklin Ridgeway, of the Department of Public Safety, recommends the erection of two additional engine houses.

Tacoma, Wash.—A committee has been appointed by the Council to provide adequate fire protection for the East Side.

Eau Claire, Wis.—A special election will be held, December 18, to decide the question of issuing $100,000 bonds to purchase the waterworks from the Eau Claire Water Works Company.

PUBLIC BUILDINGS

Santa Rosa, Cal.—The proposition to issue $250,000 Court House bonds carried.

Porum, I. T.—The citizens have voted to issue $10,000 bonds for the construction of a schoolhouse.

New Hampton, Ia.—The citizens have voted $25,000 bonds for the construction of an infirmary.

Louisville, Ky.—Arrangements are being made to erect a new police station at the corner of Seventeenth street and Southgate avenue.

St. Louis (University Station), Mo.—Plans are being prepared for the erection of a city jail.

Lewiston, Mont.—The Fergus County voters have decided in favor of issuing $100,000 bonds for building a Court House.

Livingston, Mont. — The Cooke County Board has decided in favor of issuing $25,000 bonds for the erection of a jail.

Arlington, Neb.—The proposition to issue $15,000 school bonds carried.

Trenton, N. J.—An ordinance providing for the issuing of $300,000 City Hall bonds is being considered by Council.

Towner, N. Dak.—The bond proposition for building a Court House in McHenry county carried.

Pawhuska, Okla.—The citizens have voted to issue $30,000 bonds to build schoolhouses.

Waynesboro, Pa.—Bids will be received by the Board of Education, December 10, 8 p.m., for $20,000 4 per cent., 15 to 30-year optional building bonds.—J. E. Franz, Secretary.

Claremont, Va.—Bonds, $6,000 for schools and $2,000 for artesian wells, have been voted.

Shinnston, W. Va.—The citizens have voted to issue bonds for the erection of a new high school building.—Address C. L. Watkins.

STREET RAILWAYS

Trinidad, Col.—The Trinidad Electric Railway Company is contemplating an extension of its line to Reilly.

Kankakee, Ill. — The Kankakee Electric Railway has been incorporated with a capital stock of $100,000.

Tipton, Ia.—The Empire Railway Construction Company, incorporated with a capital stock of $1,000,000, will build the Iowa and Northwestern railroad between Watertown and Stanwood, a distance of about 100 miles. Head offices of the company are at Waterloo. George E. Armstrong, Waterloo, President.,

Wichita, Kan. — An ordinance has been issued granting to the Wichita Railroad and Light Company the right to construct, operate and maintain a street railway on Waco avenue south of Second street.

Gladwin, Mich.—The Grand Rapids Electric Railway Company has filed at the Register of Deeds office a deed of trust to secure $250,000 for the purpose of constructing electric roads.—J. Boynton, President.

Wayland, Mich. — A franchise has been granted to S. Phelps, of Chicago, to operate an electric-light plant.

St. Louis, Mo.—The North St. Louis and Suburban Railway Company has secured a franchise to construct a double track railroad from the city limits out the old Hall's Ferry road to the Jennings Station road. John Scullin and others are promoting the road.

Waynesville, Mo. — The Ozark Traction Company has been incorporated with a capital stock of $80,000 for the purpose of building and operating an interurban railway to Mountain Grove. W. G. Gan, Waynesville, and J. J. Burns, of Webster Grove, are Incorporators.

Cleveland, O.—The Cleveland-Alliance and Mahoning Valley Railroad Company has been incorporated to build a trolley line from Cleveland to the Stark Electric Railway at Alliance.—Address James W. Holcomb.

Youngstown, O.—The Mahoning Valley Belt Line Railway Company has been incorporated with a capital of $10,000.—Harry G. Hamilton, Patrick L. McNally and others, Incorporators.

Dallas, Tex. — The Dallas Consolidated Electric Street Railway Company will extend its line to Oakland Cemetery.

Milwaukee, Wis.—The Milwaukee Electric Street Railway and Light Company is preparing to extend its line from Milwaukee to Fox Lake and Holy Hill.

BRIDGES

Montgomery, Ala.—The City Engineer has been directed to let contracts for the erection of a bridge across the White Hough, several miles from the city on the Woodley road.

Phoenix, Ariz.—A girder deck span steel bridge will be built across the Gila river by Maricona, Phoenix and Salt River Valley railroad; the same will be 1,200 feet long, consisting of seventeen spans of about 70 feet each; estimated cost, $60,000.

Maysville, Cal.—The Supervisors of Glenn and Napa Counties propose to build a joint bridge; estimated cost, $60,000.

New Haven, Conn.—The city and the New York, New Haven and Hartford Railway Company agreed to build overhead street bridges at Sackem and Grant streets.

Chicago, Ill.—North Side business men have petitioned the Commissioners of Public Works for a bridge to span the Chicago river at Orleans street.

East St. Louis, Ill.—The city will expend $50,000 in reconstructing the viaduct crossing Cahokia creek, at Broadway.—J. W. Crocken, City Engineer.

Council Bluffs, Ia.—Bids are now being received for the county bridges to be constructed in the year 1907.

Bluffton, O.—The Commissioners of Wells county have appropriated $15,000 for the erection of a bridge across the Wabash river, at Main street.

Toledo, O.—The Cumberland County Board has been petitioned to aid in building bridges in Cottonwood township.

Greensburg, Pa.—Plans are being prepared for a concrete bridge over the Pennsylvania line at Main street.

Petersburg, Va.—A resolution has been passed authorizing the construction of a concrete bridge over Appomattox river, at a cost of $7,500.

Roanoke, Va.—The Roanoke Street Railway is having plans prepared for the construction of an iron bridge over Tinker and Glade streets.

North Yakima, Wash.—The bridge across the Natches river has been taken out by flood; a new one will probably be built.

Charleston, W. Va.—The Kanawha Valley Traction Company will erect a bridge over the Kanawha river; it is proposed to construct a foot, street car and railroad bridge.—E. W. Alexander, General Manager.

Racine, Wis.—The Chicago, Milwaukee and St. Paul Railway Company will reconstruct the viaduct over its tracks at State street, at a cost of $12,000.—D. J. Wittemore, Chicago, Ill., Chief Engineer.

MISCELLANEOUS

Whittier, Cal.—The citizens have voted to issue $9,000 bonds for improvements.

Charleston, Ill.—The County Board is preparing to sell city bonds.

Des Moines, Ia.—Bids were received by W. E. Cole, Q. M., for constructing crematory, etc., at Fort Des Moines, as follows: (A) Crematory building, complete, plan special 1-620; (B) veterinary stable, plan 166; (C) shelter for mounted guard, plan B, special; (D) additions to and alterations in subsistence storehouse, plan 3-562, special C; (E) bakery; (F) total: Charles Weltz's Sons, Des Moines, (A) fuel room and oven foundation, $2,147; (A)—alternate "A," $2,140; (A)—if alternate "C," all for $3,000; (B) $17,541; (B)—if alternate "A," $16,810, (C) $1,989; (C) alternate "A," $1,889; (D) $9,172; (E) $485; (F) $31,334. C. E. Atkinson, Webster City, Ia.: (A) fuel room and oven foundation, $4,462; (B) $22,452; (C) $2,570; (D) $11,789; (E) $472; (F) $41,745. M. A. Blanchard, Topeka, Kan.: (A) fuel room and oven foundation, $4,082; (B) alternate "B," $22,369; (B) alternate "C," $22,146; (C) $2,813; (D) $12,989; (E) $654; (F) $42,579. J. E. Tusant, Des Moines, (B) brick foundation, $18,424; (B) concrete foundation, $18,624; (B) stone foundation, $18,324; (D) $7,154; (F) $25,578. Cremator: (AA) crematory and cremator, complete, per plans submitted; (BB) cremator, complete; (CC) crematory building proper, complete, plan 1-620. Lewis & Kitchen, Chicago: (BB) $3,982; steel chimney lined 20′ with fireclay tile, $880; steel chimney lined entire length with fireclay tile, $1,295; brick chimney, $1,975; (CC) $2,790. Morse-Boulger Destructor Company, New York: (AA) $7,888; (BB) with steel stack, $5,333; with brick chimney, $962; (CC) $2,555. Dixon Garbage Crematory Company, Toledo, O.: (AA) $6,815 and 8,190; (BB) $5,875; (CC) $3,000. Machinery, etc., Werner & Pfleiderer, Saginaw, Mich., $5,140.

Rochester, N. Y.—The following bids were received for garbage collection, etc.: Thomas Holahan, garbage collection and erection of plant outside city, $96,000 a year; Charles W. Hartung, for collecting and disposing of garbage if city provides plant, $60,000 a year; Charles Edgerton, of Philadelphia, garbage collection and erection of plant outside city, $90,000 a year; Empire Reduction Company, represented by C. E. Titman and E. M. Cooper, for garbage disposal and erection of plant in city, $59,770 a year; for garbage collection and erection of plant outside city, $75,000 a year; the bids have been referred to Edwin A. Fisher, City Engineer.

Schenectady, N. Y.—The Board of Health has adopted a resolution to establish plants for the final disposition of garbage and sewage.

Lorain, O.—Council has been asked to appropriate $3,000 additional for the purchase of a 300-h.p. boiler; specifications for the new boiler have been accepted by Council.

Steubenville, O.—The government engineers report that $16,000 will be required to complete the engineering work upon the fortifications and river improvements projected by the Board convened under the President's orders of January 31 last.

Chattanooga, Tenn.—A movement for a bond issue for public improvements has been inaugurated by the City Council.

Salt Lake, Utah.—Council has decided to expend $130,000 in improvements the coming year.—C. Kelsey, City Engineer.

BOOK REVIEWS

Engineering Work in Towns and Small Cities.—By Ernest McCullough. Technical Book Agency, Chicago. Price, $3.00. "This book is written for two classes of officials in towns and cities having a population of less than twenty thousand inhabitants. Elected officials and those who have had no technical education belong to the first class. The second class is composed of engineers and surveyors holding the position of Town or City Engineer, especially those with little or no previous experience in municipal engineering." "Both will appreciate the chapters preceding those on office work. The chapters on field and office work and engineering data are intended solely for engineers." Three points first impressed the reviewer: the first, that the typography, printing and paper are poor; the second, that more paragraph headings are needed, there being whole chapters which have no sub-headings or other method of indicating sub-topics; and the third, that the author had shown favoritism to advertisers. For instance, appendix A is entitled "Mixing Concrete with Machines," but describes one machine only. Appendix B, entitled "Trenching Machines," similarly describes but one machine, and that by the same maker as the concrete mixer. In appendix D. "The writer presents here a selected list of names of the leading manufacturers of and dealers in materials and appliances," but neglects to state that the selection was made easy by simply giving the names of those who advertised in the back of the book; the publishers of the book and W. & L. E. Gurley, for instance, being the only book dealers mentioned. Alternate pages throughout the index are devoted to advertising. Aside from this, however, the index is good; and a great deal of valuable matter is contained in the book; in fact, the more carefully it is read, the better the opinion of it is apt to be. For the classes for which it is intended it gives more information than probably any other one book; although the best of judgment has not been used in apportioning space, as when 10 per cent. of the book was devoted to the Chicago specifications for sewers and pavements. But, what is more important, few of the statements made show anything but the best of judgment and discrimination; although his Western experience apparently had led the author to say that, "In earth and gravel streets the cross-walk is usually of wood," "stone flag sidewalks are out of date," and "that it is becoming common practice to have street names set into the concrete of the walks" (which, by the way, is his only reference to street signs). He also describes but one, and that the poorest, method of preparing wood blocks for paving, viz., dipping in asphalt. The chapters are divided as follows: The City Engineer and His Duties, 10 pages; Roads and Streets, 10 pages; Walks, Curbs and Gutters, 9 pages; Street Pavements, 24 pages; Sanitation, 9 pages; Drainage, 8 pages; Sewerage, 19 pages; Water Supply, 14 pages; Concrete, 27 pages; Building Department, 11 pages; Miscellaneous Data, 20 pages; Contracts and Specifications, 68 pages; Office Systems, 30 pages; City Engineers' Records, 33 pages; Field Work, 27 pages; Engineering Data, 143 pages; Index, 11 pages; a total of 483 pages.

Census of Manufactures.—Bulletin 57. Bureau of the Census. Department of Commerce and Labor. These statistics form a part of the census of 1905, the object of the bulletin being to present general information in a form convenient for ready reference. The table of most interest to students of municipal affairs is No. 45, which treats of gas. From this we learn that the total cost of materials used in the manufacture were worth $37,180,066, of which coal cost $14,607,485; oil cost $14,539,585; water cost $253,895; coke cost $1,692,761, and all other materials $6,176,340. The aggregate value of all the products manufactured was as follows: Gas, $112,662,568; coke, $5,195,461; tar, $2,064,343; all other products, $972,992; total, $125,144,945. From table 84 we learn that there was spent for salaries $8,463,699, for labor $17,057,917, and for miscellaneous expenses $29,557,273.

PATENT CLAIMS

834,322.—Subway or Tunnel Construction. Richard W. Raftis, Chicago, Ill., assignor of one-sixth to Edward P. Eastman, Chicago, Ill. Filed Apr. 27, 1906. Serial No. 314,015.

A tunnel or subway having its walls formed of an outer layer of concrete and an internal lining of tile, said tile being formed of a main body portion having openings therein, securing-arms projected from one of the side faces of the said body portion, said arms being provided with inwardly-extending shoulders, said shoulders being formed of an angle of forty-five degrees extending from a point upon the arm slightly beyond the side face of the body portion, for the purpose set forth substantially as described.

834,645.—Ditching-Machine. Jorgen H. Sylvestersen, Dundee, Ill. Serial No. 301,668.

In a machine of the class described, a cutting-frame including side members and a bottom cutting-blade, in combination with spaced bars connected with one side member and with the bottom member of the frame, said bars being curvel smoothly and evenly from their point of attachment to their terminal ends to constitute a moldboard free from angles and other obstructions to the passage of elevated material, a shield or landslide, and a shoe hinged and inserted beneath the moldboard, in front of the landside in close proximity to the bottom cutting-blade.

835,012.—Manhole Construction. David Craig, Melrose, Mass. Serial No. 241,588.

A manhole construction, comprising a manhole-casing; a plurality of flanges on the upper side of the casing forming channels between them, said flanges being so proportioned that the innermost flange affords a line of support or bearing for the cover, said supporting-flange being provided with ventilating-apertures; and a cover resting on said supporting-flange and provided upon its under side with a plurality of depending flanges extending into the channels of the casing.

Civil Service Examinations

Civil Engineer.—The United States Civil Service Commission announces an examination January 3-4, 1907, to secure eligibles to fill vacancies in the position of civil engineer in the Philippine Service at $1,400. Apply to the U. S. Civil Service Commission, Washington, D. C., or to the Secretary of any Board of Examiners for application forms 2 and 375.

Computer.—The United States Civil Service Commission announces an examination on January 9-10, 1907, to secure eligibles to fill a vacancy in the position of computer in the Coast and Geodetic Survey at $1,000 per annum. Apply to the U. S. Civil Service Commission, Washington, or to the Secretary of any Board of Examiners for Form 1312.

Draughtsman.—Naval Station, New Orleans, La.—An examination will be held at the Navy Yard, Brooklyn, N. Y., December 12, to fill the position of draughtsman, structural steel work, at New Orleans, La. Address Commandant, Navy Yard, Brooklyn, N. Y.

LEGAL NEWS

A Summary and Notes of Recent Decisions —Rulings of Municipal Interest

Belmont Tunnel Franchise

New York and Long Island Tunnel Company vs. **City Fire Commissioner.**—The court holds that the Commissioner was not justified in revoking the blasting permits of the contractors doing the tunnel work. Justice Fitzgerald comments upon the alleged failure of the plaintiff to obtain the consent of the Department of Docks to cross the 300-foot strip of land under water outside of the pier head land and rules that this proposition does not affect in any way the validity of the company's charter.—Supreme Court, New York City.

City Loses Water Front

Gonzalez vs. **City of Pensacola.**—The first case in the water front litigation resulting from the city seizing certain property which was swept clear by the hurricane, and holding by right of titles granted by the Water Front Commission, resulted in a verdict for the plaintiff, G. Walker Gonzalez. The latter held property on the bay front near South Alcaniz street, which he had been in possession of for many years. Immediately after the storm he began to rebuild fences. He was stopped by the city, the latter claiming possession of the property, and preventing him from rebuilding.—District Court, Pensacola, Fla.

Compensation for City

Mayor of City of New York vs. **Board of Street Openings.**—Land needed for the opening of Vancortland avenue had previously been acquired by the city for a right of way for a water pipe line. It was held that the city was entitled to be compensated for lands taken for the purpose of a city avenue. The charter of the city provides that the expense of laying out a public street shall be assessed upon the lands benefited.—New York Court of Appeals.

Paving Contract Valid

Hellar vs. **City of Tacoma.**—W. G. Hellar and other property owners were seeking to avoid paying special taxes aggregating $41,000 for paving done by the Barber Asphalt Paving Company, claiming the contract for paving was void because the work was delayed beyond the charter contract limit. The court finds the delay was caused by the Street Commissioner's orders, and holds that as long as the delay was ordered by him in good faith for the benefit of the city such time lost not from fault of the contractor should not be counted within the charter limitation. The contract is held valid and the taxes are approved. The appeal of Hellar and others is dismissed.—Supreme Court, Olympia, Wash.

Garbage Crematory a Nuisance

John Doe vs. **Garbage Crematory Co.**—Justice Garretson has handed down a decision restraining the operation of a garbage crematory at Rockaway Park. He holds that the plant is offensive, injurious to health and comfort, and a menace to property interests in the section.—New York Supreme Court, Second District.

CONVENTION NOTES

The Society of Municipal Engineers, in accordance with an arrangement made by the Committee on Inspection with the officials of the Delaware, Lackawanna and Western Railroad, met at the Ferry House at the foot of West Twenty-third street, on the morning of November 23, for a comprehensive tour of inspection of the terminals and improvements of that railroad under the escort of Chief Engineer Bush. A photograph of the hundred members of the society, these varying in ages and experience from recent college graduates to Mr. Hazwell, a member still active at the age of 97, was taken in the new ferry house before the trip began. Some peculiarities of the construction of the ferry house were noted; some of them, due to the circumstance that about half of the framework of a former building, destroyed by fire, was still in use. The walls of the first building were of wooden sheeting attached to channel irons laid flatways with the space between the sheeting filled with mineral wool. This construction, far from making a fireproofing, acted rather as a chimney, the mineral wool being porous, and as the fire started under the lower floor, only augmented the flames. In rebuilding expanded metal was hung from the posts and channels and, of course, finished with mortar. This has the advantage of a not too rigid construction, and is calculated to withstand the shocks of the ferry boats making landing. Another interesting feature is the provision for settlement, three feet of wall hanging below the floor like a curtain for this purpose. Shallow water extends under most of the building and the process of settling and moving out into the river is provided for. At the Hoboken terminal somewhat similar conditions as to foundations prevail and the building is mostly over water. The depth of the water near the concrete sea wall is about 10 feet; under this are about 10 feet of shifting silt. A pile has to be driven 30 feet before it takes any sort of a hold and would have to be driven 115 feet to strike rock. As a matter of fact, the piles were driven 80 feet or thereabouts and provisions are made for raising the building when the caps on which it rests sink. The floor is carefully braced and interlocked to equalize the load as much as possible. The new train shed, however, seems to be Mr. Bush's particular delight, and on the construction of this he dwelt at length. This shed is low, only a few feet higher than a car, and the essential feature of it is the smoke duct—an opening over the center of the track through which steam and gases from the engine escape. The roof is supported by cast-iron posts in the center of the walks between the tracks; wrought-iron pipes run through these pillars to carry the water that collects on the roof. All iron work in the roof is covered with concrete and large skylights of wire glass form a considerable percentage of the area. Mr. Bush called attention to the advantage of receiving light from a skylight only ten feet from the car window as compared with lighting from glass at the top of a high shed, obscured by smoke, inaccessible and never cleaned. The cost of the Hoboken terminal is estimated at two-and-a-quarter million dollars, a very moderate sum considering its facilities as compared with the cost of terminals being built in New York City. A special train took the party out on the line; in passing through the tunnel under Bergen Hill a glimpse was caught of the work on a new tunnel which is being built parallel to the old one. Regulations made for safety in operating the old tunnel at the present time limit the traffic during busy hours, and on the completion of the new tunnel a great increase in volume of traffic will be possible. At Newark a stop of an hour was made for lunch, after which the methods of eliminating grade crossings were noted. The tracks were elevated more than twenty feet at Broad street, Newark, and lowered over twenty feet in Roseville, about a mile away. A stop was made at the inclined plane in Roseville, where a peculiar problem was solved. The new grade of the railroad is six feet above the old water level of a canal crossing the railroad's right of way. An inclined plane with tracks, a cradle to carry a canal boat and an electric power plant serve to overcome the difficulty and incidentally carry the boats across a street parallel to the railroad on the level of the street. Betwen Roseville and Summit the train made no stop. There the work of eliminating grade crossings was noted. On the return trip the train was run over the main line and a long stop made at Kingsland, where the company has built and is still building extensive repair shops.

Calendar of Meetings of Municipal and Allied Societies

December 5.
American Society of Civil Engineers.—Paper on the "Peculiar Characteristics of the Atchafalaya River."—Charles Warren Hunt, Secretary, 220 West 57th street, New York City.

December 3-7.
American Public Health Association.—Thirty-fourth annual meeting, Mexico City, Mexico.—Dr. Charles O. Probst, Secretary, Columbus, Ohio.

December 4-7.
American Society of Mechanical Engineers.—Annual meeting, New York City.—F. R. Hutton, 12 West 31st street, New York City.

December 5-7.
National Association of Manufacturers of Sand-lime Products.—Third annual convention, Chicago, Ill.

December 5-7.
National Drainage Conference.—Oklahoma City, Okla.—A. W. Knead, Secretary, Oklahoma City, Okla.

December 6-7.
Charter Convention of the Cities of North Dakota.—Meeting to be held at Grand Forks.—W. A. Joy, Chairman of Committee.

December 6-7.
National Rivers and Harbors Congress.—Convention, Washington, D. C.

December 11-12.
American Portland Cement Manufacturers.—Fourth annual meeting, Hotel Astor, New York City.—C. Earle E. Bottomley, Assistant Secretary, Land Title Building, Philadelphia, Pa.

December 27-January 2.
American Association for the Advancement of Science.—Annual meeting, New York City.—L. O. Howard, Secretary, Cosmos Club, Washington, D. C.

January.
American Institute of Social Service.—Exposition, New York City.—Dr. William H. Tolman, Director, 287 Fourth avenue, New York.

January 24.
Ohio Local Health Authorities.—First annual conference, Columbus, Ohio.

February 15-16.
Wisconsin Gas Association.—Annual meeting.—Henry H. Hyde, Secretary, Racine, Wis.

February 22.
New England Association of Gas Engineers.—Annual meeting, Boston, Mass.—N. W. Gifford, Secretary, New Bedford, Mass.

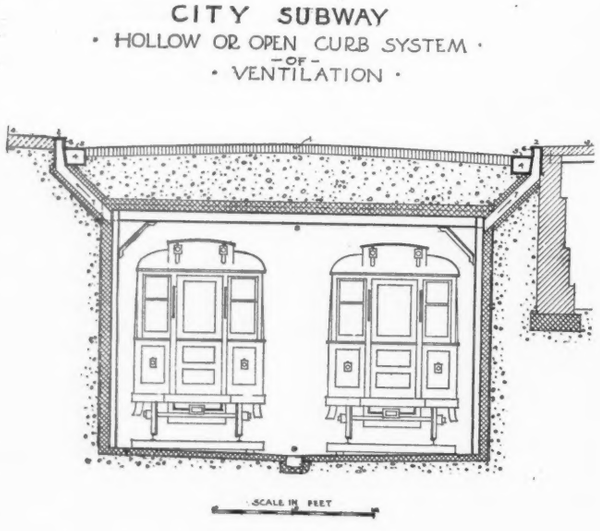
April 18-21.
Southwestern Gas, Electric and Street Railway Association.—Annual meeting, San Antonio, Tex.—Frank C. Duffey, Secretary, Beaumont, Tex.

PLANS FOR SUBWAY VENTILATION

Hollow Curb Invented by Robert E. Booraem May Solve Problem—Iron or Concrete May Be Used.

THE most important objection to the subways of New York is the impure air found there, which much thought of many experts, ventilating fans, and large, grated openings have so far failed to remedy. A suggestion has been made and worked out in detail by Robert E. Booraem for supplying communication with the outer air through an open or hollow curb, which is shown in the accompanying illustration. Here 1 is the street, 2 the hollow curb, 3 the sidewalk, 4 a sunken gutter, 5 a heavy iron grating over the gutter, 6 a screen in front of the opening in the curb, 7 flues connecting the subway with the open curb, 8 top of subway. The curb may be of iron or concrete. The flues may be practically continuous throughout the length of the subway, except at street crossings. The sunken gutter is to carry the street water, the grating permitting vehicles to approach the curb as at present. This gutter may be of any necessary dimensions and lead to catchbasins or directly to the sewer.

With a 4-inch opening in the curb face, the area of this opening is equivalent to an 8x8-foot square shaft for every 100 feet of subway. Another advantage claimed for this construction is that it furnishes a means for washing out the subway from the street hydrants by hose. (It is pretty generally recognized now that the roadbed should be of concrete, or so constructed as to permit of thorough washing.) Recently large grated openings in the sidewalks have been constructed for subway ventilation, but the considerable volumes of foul air collected from some ten blocks which emerge from them are very unpleasant to pedestrians and cause an unjust injury to adjacent property. It is claimed that, in addition to the natural rising of the heated air of the subway, trains will force foul air out through the hollow curbs ahead of them and suck in fresh air behind them; and that trains stalled at any point between stations will have ample ventilation.



PERSONALS

BATTEY, GEORGE FRANKLIN, District Chief of the Fire Department of Providence, R. I., who, in the service over thirty years, died recently, in the sixty-ninth year of his age.

BELT, WILLIAM, T., Chief Engineer of the Fire Department of Washington, D. C., recently went on a hunting trip to North Carolina, the duties of his offices being fulfilled during his abscence by Deputy Chief Engineer Frank J. Wagner.

COONEY, PETER A., of New Orleans, La., father of the movement for increases in the wages of firemen, has been re-elected Fire Commissioner by the City Council, for a term of seven years.

DANA, JUNIUS, only brother of the late Charles A. Dana, of the New York *Sun*, of Warren, Ohio, who served his city as Councilman and City Engineer, and Trumbull county as Surveyor and Auditor, passed away recently. He was born in Hindale, N. H., 80 years ago.

DYER, ELISHA, Mayor of Providence, R. I., Governor of the State three terms and a veteran of the Civil War, died suddenly at his home, November 29, aged sixty-seven years.

FUERTES, JAS. H., of New York City, has been engaged to report on an improved water supply by filtration or artesian wells for the city of Steelton, Pa., by the Special Committee on Water of Council, of which J. V. W. Renders is chairman.

HALL, T. J., Chief of Police of El Paso, Tex., has resigned, and the same has been accepted by the City Council.

HARDING, JAMES C., Assistant City Engineer of Pittsfield, Mass., has resigned.

HINES, THOMAS R., and E. A. Doyle, Assistant Engineers in the City Engineer's Department of Baltimore, Md., have resigned to accept positions on the Chicago drainage canal.

HORTON, GEORGE W., Chief Engineer of the Fire Department of Baltimore, Md., and Marshal of Police Farnan have had their salaries increased from $2,650 to $3,000 per annum; President Soper, of the City College, from $2,700 to $3,000; Secretary Wilkinson, of the Fire Board, from $1,600 to $1,800, and the City Register from $3,300 to $3,700, on the expiration of Mr. Hooper's term of office, June 1, next.

KALLER, M. S., formerly Assistant Chief of the St. Paul, Minn., Fire Department, subsequently Chief of the Superior, Wis., Fire Department, and still later Captain in the Duluth, Minn., Fire Department, died recently at Rochester, Minn.

MCINTOSH, WILLIAM, of New Orleans, has been engaged to prepare plans for a water system for the town of Winnfield, La.

MINSHALL, FREDERICK, of Abbeville, S. C., is preparing plans and specifications for a sewerage system for Camden, S. C.

MORSER, E. J., recently tendered his resignation as Chief Assistant City Engineer of San Francisco, Cal.

MULHOLLAND, C. H., has been employed as engineer for the proposed sewage disposal plant for New Castle, Pa.

PARSONS, ROY H., who prior to becoming connected with the Warren Bituminous Paving Company two years ago, was in the Engineering Department of Ottawa, Canada, has been appointed City Engineer of the Canadian capital, Vice George H. Richardson, resigned.

PEARSON, GEORGE W., Consulting Engineer of Kalamazoo, Mich., has prepared plans for a sewerage system for St. Joseph, Ill.

ROBERTS, GEORGE M., one of the first Mayors of Omaha, Neb., and for many years attorney for the Big Four Railway, died recently at Lawrenceburg, Ind., aged 62 years.

RYAN, JAMES F., has been appointed Assistant Superintendent of Parks for the Borough of Manhattan and the Bronx, New York City.

SMITH, C. B., who has charge of the construction of the Winnipeg, Canada, municipal hydro-electric works, will be assisted by a Board of Consulting Engineers, consisting of Prof. Louis Herdt, of McGill University, electrical engineer, Col. H. N. Ruttan, City Engineer of Winnipeg, hydraulic engineer, and William Kennedy, Jr., of Montreal, mechanical engineer.

TROUTMAN, H. W., has been appointed City Engineer of Aberdeen, Wash.

Some Unusual Fires

ABERDEEN, S. D.—Sherman House and other buildings burned, November 20. Damage, $200,000.

CHATTANOOGA, TENN.—Workshop at new Cincinnati Southern shops burned, November 22. Cause, incendiary; damage, $15,000.

CLEARFIELD, PA.—One of three boilers belonging to the Clearfield Electric Light and Power Company exploded, November 25. Damage, $100,000.

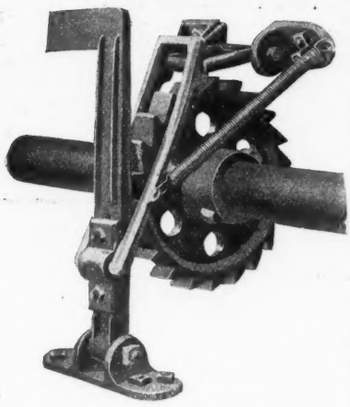
DOYON, N. D.—City Hall and other buildings burned, November 22. Damage, $10,000.

GALLITZIN, PA.—Opera House and other buildings burned, November 29. Damage, $250,000.

LYNCHBURG, VA.—Several business buildings burned, November 29. Damage, $125,000.

SAN FRANCISCO, CAL.—Twenty cottages between Eighteenth and Kentucky streets burned, November 23. Damage, $50,000.

PORTABLE DUMPING WAGON BED

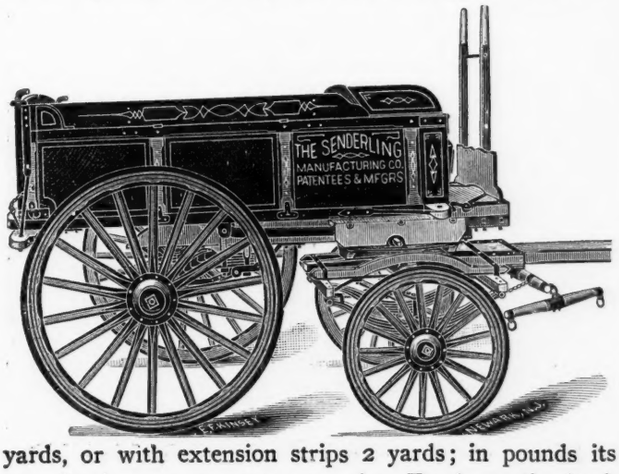


EVERETT DUMPING DEVICE

THE Everett Manufacturing Company, of Newark, New York, has put on the market a bottom dumping wagon, which is constructed with a bottom of four doors, the inner two of which drop, turning on a center hinge, so as to form a V-shaped protection for the reach. This arrangement gives the dumping apparatus an ease in action which is not surpassed by the dumping device of a regular bottom-dumping wagon, for, on account of the narrow width of the doors, there is less leverage to pull against, in the case of trifling obstructions, and the doors have a shorter distance to travel in order to close. A truss in the middle of the bed supporting it on the sides and underneath is a peculiar feature. In unloading, this truss drops, allowing the doors to open. The points of superiority claimed for this portable bed are: Low cost as compared with a complete wagon; convenience in shipping; small space occupied and light weight; even distribution of load over axles; tight body; simplicity, ease, security and certainty of dumping device; foot action in dumping and taking up, leaving arms free; support and strength given by a peculiar truss in the middle of the wagon body.

CONTRACTOR'S DUMPING TRUCK

THE Senderling Manufacturing Company, 627 West Forty-seventh street, New York City, manufactures a contractor's dumping truck or four-wheeled cart which discharges its load from the rear. In the frame work of the wagon all wood used is white oak or hickory, and the floor of the bed is maple. The running gear is substantial, in accordance with requirements for heavy work in a large city. The capacity of the wagon is 1½ cubic



yards, or with extension strips 2 yards; in pounds its capacity is 5,000 to 5,500 pounds. To dump the load, the driver loosens two hooks which fasten down the front of the wagon, takes a crank operating a pinion working in a ratchet, which carries the body backwards a short distance, where it dumps at an angle that allows free and quick dumping of the load, so that danger of lifting the front wheels of the wagon off the ground is avoided, and the shock on striking the ground is light. The advantages claimed for this truck are: full springs; short dump, *i.e.,* close to hind axle; uniform distribution of load; compactness—short geared, no lost space in front, front wheels turn under; lightness—2,850 to 3,300 pounds; easy to operate; simplicity; economy; no danger of going overboard when dumping into scows or lifting of front gear off the ground; no shock on striking ground.

TRADE NOTES

TURBINES.—The Wilkinson Steam Turbine Company, Providence, R. I., Edward K. Hill, President, has effected a permanent organization and made arrangements for placing its machines on the market. The turbines will be built at the Corliss Steam Engine Works, Providence.

DESTRUCTOR.—The Meldrum Brothers' Four-Grate Destructor has been selected by Mr. William Calder, C.E., for use in Prohram, Australia, as a result of his trip to England and this country. This is the third Meldrum destructor purchased for use in Australia in the last four years.

INJECTORS.—The *Penberthy Engineer and Fireman* is a monthly publication of the Penberthy Injector Company, Detroit, Mich. The September number has articles on "Heat," "Lessons from Experience in Selecting an Engineer," "Chronic Thump, and What Caused It," and "The Electric Elevator." In the advertising pages the Penberthy specialties are described.

Proposals

PAVING

Amityville, N. Y.

Sealed proposals will be received until January 7th, 1907, by the Board of Trustees of the Village of Amityville, N. Y., for macadamizing and otherwise improving Broadway from Albany avenue, southerly to Avon place, and Park avenue, from Broadway, southerly to Ireland place. Details of proposals, plans and specifications can be had on application to Charles W. Darling, Village Engineer, Amityville, N. Y., or to W. B. Inglee, Village Clerk, Amityville, N. Y., or to E. P. Foster, Village President, 132 Nassau street, New York City.

The Board of Trustees reserve the right to reject any or all bids or to increase or diminish the amount of work to be done.

By order of the Board of Trustees,

W. B. INGLEE.
Clerk of the Village of Amityville, N. Y.

Dated December 1st, 1906.

Steel Bridge

Carthage, Tenn.

Bids will be received up to Dec. 15, 1906, at noon, for the construction of a 600-ft. steel highway bridge across the Caney Fork River, about three miles from Carthage, Tenn., according to plans and specifications on file at my office. The right to reject any or all bids reserved. Bridge will be paid for in cash.

W. E. MYER,
Agt. for Carthage & Granville Bridge Co.